

A TEXT-BOOK OF THE DISEASES OF THE SMALL DOMESTIC ANIMALS

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Preface to the Fourth Edition

THE Diseases of the Small Domestic Animals has been written and revised as a text-book for students and as a quick reference for the busy practitioner. The author has kept in mind these principles throughout the entire text. The text includes all of the important diseases (medical and surgical) in a brief yet concise form arranged in systematic order, so that all facts can be obtained instantly. The author hopes that the text will continue to serve its purpose as in the past.

For scientific reasons the metric system has been retained throughout the text. A table of equivalents in weights and measures has been inserted so that dosage can readily be determined in the other system if desired.

The arrangement of the material in the text has been slightly modified in order to bring it up to date. In the past the arrangement has met with universal favor, therefore changes have been kept to a minimum.

Many changes have been made in the subject matter in order that the latest scientific developments could be inserted whenever necessary. Some subjects have been rewritten to conform to the present knowledge.

The subject matter relating to parasites and parasitic conditions has again been checked over carefully to include the latest information and to bring nomenclature up to date. The author wishes to express his appreciation to Dr. Russell E. Rebrassier, Chairman of the Department of Parasitology, for revising this section of the text. Further recognition is given to Dr. Walter R. Hobbs, Secretary to the College of Veterinary Medicine, for his valued services in checking over and revising other portions of the text-book. The author is indebted to others who have made suggestions and materially assisted with the revision of the book.

The author further appreciates the kind reception given to the other editions of this book and he sincerely hopes that this edition will also prove to be of value to students, practitioners and others interested in the Diseases of the Small Domestic Animals.

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Diseases of the Small Domestic Animals

PART I

DISEASES OF THE RESPIRATORY SYSTEM

CHAPTER I

DISEASES OF THE NASAL PASSAGES

Examination.—The nasal passages are very small and do not admit of a free examination. In some breeds of dogs (English bulldog, Boston terrier) there is an obstruction of the nasal passages which during inspiration produces a peculiar snoring sound. This should not be mistaken for an abnormal condition. In other breeds (Collie) where the nasal passages are longer and less tortuous, respiration produces no sound. Dogs breathe freely through the mouth. In the cat the nasal passages are very small and short and can only be examined at their openings.

The examination of the nasal passages should be made as follows: good light such as ordinary daylight or strong artificial light is necessary. A mirror to reflect light into the nasal openings is of little value as the passages are so small that the light will be reflected only a short distance. A very small nasal dilator will be found useful in some of the larger breeds. A small flexible probe with a pledget of cotton securely wrapped around one end, large enough to occlude the nostril when inserted rather high up, will at once induce sneezing and the character of the secretions from the opposite nostril can be more easily determined. The probe is then removed and inserted in the other nostril for a similar examination. The nose in health is moist and cool with a very thin, slight mucous discharge. The mucous membrane is variable in color; in most breeds dark, in other slight with dark spots, and in a few breeds pink.

Abnormal conditions to be noted are the following:

Tumors.—Small papillomata on the skin and mucous membrane at the entrance to the nasal openings are frequently seen. Epitheliomata extending from the lips to form a diffuse enlargement which may partially or completely obstruct the nasal openings. Polypoid enlargements on the mucous membrane of the nasal passages are often noted and can be accurately determined by using a small, fine wire snare to pull them toward the nasal opening.

Foreign Bodies.—Frequently in hunting dogs small pieces of straw, twigs and other foreign material will be found rather high up in the passages. These injure the mucous membrane and often become deeply imbedded in it and the underlying tissues.

Parasites.—The *Linguatula serrata* (*Linguatular hinaria*) is occasionally found in the nasal passages and when suspected the nasal discharge should be examined microscopically to reveal the presence of the eggs of the parasite.

Infectious.—Distemper infection frequently takes place in the nasal passages and produces both local and general symptoms. Staphylococcus infection from wounds in the mucous membrane, or as secondary infection following distemper, is of common occurrence. In these conditions the nose is usually dry and hot, showing numerous fissures on the mucous membrane and on the borders of the nasal openings.

Hemorrhage.—This occurs often from injuries, as blows over the nasal bones, fractures of the nasal bones; from punctured wounds through the bones and from injury to the turbinated bones and from infestation with parasites.

Malformations.—Some diseases (rachitis) produce a deformity of the nasal bones interfering with the free passage of air through the nostrils and producing marked enlargement of the nose.

Discharge.—Acute and chronic nasal catarrh (coryza, rhinitis) the mucous and serous discharge from the nasal passages is greatly increased. The general condition is but little disturbed.

ACUTE NASAL CATARRH

Coryza—Rhinitis

Definition.—An acute inflammatory condition of the nasal mucous membrane producing a serous or mucous discharge.

Etiology.—(a) Inhalations of dust or other foreign material.

(b) Inhalations of irritating gases or chemicals.

(c) Exposure to cold (cold draughts of air).

(d) Ordinary infection (staphylococcus, etc.); specific infections (distemper, etc.).

(e) *Linguatula serrata* (early stages of invasion).

During the first stages there is hyperemia and dryness of the nasal mucosa, which is soon followed by a discharge that is serous, seromucous, or mucopurulent. This discharge often causes excoriation of the tissues with which it comes in contact. In non-pigmented membranes the congestion is more prominent.

The discharge when examined with the microscope shows epithelial cells, leukocytes, bacteria and sometimes the eggs of the parasite, *Linguatula serrata*.

Symptoms.—Sneezing and the presence of a thin, serous discharge in the early stages, which later is mixed with mucus, becomes dry and adheres around the nasal openings. The nose is rubbed against objects and wiped with the paws. Excoriations appear around the margins of the nasal openings.

Diagnosis.—The presence of the above symptoms and the absence of any general disturbance characterize simple rhinitis.

Prognosis.—Favorable. Recovery usually takes place in about one to two weeks.

Treatment.—*Hygienic.*—The animal should be kept warm and protected from draughts of cold air.

Medical.—Clean or spray the nasal passages with a warm boric acid (2 per cent) or sodium bicarbonate (2 per cent) solution. Other treatments such as liquid petrolatum with 3 grains of menthol to each ounce; argyrol, 5 to 10 per cent solution in water; neosilvol 10 to 20 per cent solution in water which are applied with a medicine dropper. Remove the dry discharge from the edge of the nasal openings. Apply vaseline or zinc oxide ointment to those parts as protective agents.

INFECTIOUS NASAL CATARRH OF RABBITS

Rabbit Plague—Rabbit Influenza—Rabbit Distemper

Definition.—An infectious disease involving the mucous membrane of the nasal passages, which later produces general infection.

Etiology.—The exciting cause is a small, slender, immobile bacillus. It does not form spores and is Gram-negative. This organism is also pathogenic to guinea-pigs and mice, but rabbits are most susceptible. Infection takes place by inhalation during cohabitation with affected animals, or by being taken in with the food. The organism produces a severe inflammation of the mucosa of the nasal passages and sinuses, and later enters the circulation producing general infection, causing elevation of temperature and in most cases an inflammation of the serous membranes. The infection is often carried directly to the trachea, bronchial tubes and lungs, where it produces an acute inflammatory condition.

Necropsy.—The nasal, oral and pharyngeal mucous membranes are intensively congested, swollen and covered with a purulent exudate. In the lungs are often found evidences of a bronchopneumonia. The thoracic cavity may contain a serous or purulent exudate with fibrinous deposits on the pleura. The peritoneum will also show inflammation with some exudate in the abdominal cavity. The bacilli can be found in large numbers in the exudate and in affected organs.

Symptoms.—The incubation period is from four to six days. The first symptoms noticed are depression, a copious discharge of serous secretion from both nasal openings and severe sneezing. The temperature is usually from 104° to 106° F. and there is complete loss of appetite. This discharge soon becomes thick and tenacious, adhering around the nasal openings and the hair of the chest and limbs, the animal frequently rubbing its nose with its paws to relieve the intense irritation. With the extension of the inflammation to the larynx and bronchi, dyspnea and coughing result. Exhaustion is soon noticed due to the general infection and anorexia.

Prognosis.—Very unfavorable in acute cases, death occurring in three to five days. In subacute and chronic cases in older animals the course is fifteen to thirty days. Complete recovery, however, is rare; chronic nasal catarrh is a common sequel.

Diagnosis.—The rapid development, high temperature, absence of coccidia (see Rhinitis Coccidiosa), the acute inflammation of the serous membranes and the finding of the specific bacillus in the discharges confirm the diagnosis.

Treatment.—**Medical.**—The nasal passages should be sprayed with antiseptic solutions (boric acid 2 per cent or sodium bicarbonate 2 per cent), the accumulated crusts removed with warm water and a protective dressing of zinc oxide ointment or vaseline applied. Other treatments such as liquid

petrolatum with 3 grains of menthol to each ounce; argyrol 5 to 10 per cent solution in water; neosilvol 10 to 20 per cent solution in water which are applied with medicine dropper. The use of internal antiseptics (salol 0.12 to 0.2, etc.) is indicated to combat the general infection. Autogenic vaccines may be used.

Prophylaxis.—All material soiled by the nasal discharges as well as all animals that die should be burned and well covered with lime; all parts of the hutch and the runways thoroughly disinfected, and a quarantine of at least two weeks imposed upon all newly acquired animals.

PARASITIC NASAL CATARRH OF RABBITS

Rhinitis Coccidiosa

Definition.—An inflammation of the mucous membrane of the nasal passages and sinuses due to an infection with *coccidia*.

Etiology.—This condition is due to the *Eimeria perforans* or the *Eimeria stiedæ*, which gains entrance to the nasal passages and sinuses. The discharges of affected animals are infectious. Damp hutches with soiled litter and filth in them favor the spread of the disease. Young animals are more susceptible than those fully matured, the latter usually contracting the disease in a mild form.

Symptoms.—The clinical symptoms are similar to those of infectious nasal catarrh. The nasal discharge is present, being serous at first, later becoming thick and tenacious. After two or three days the animals become depressed, frequently gnashing the teeth and rubbing the nose. The temperature, however, is subnormal. In some cases the mucous membranes of the mouth and the conjunctiva exhibit catarrhal symptoms. In cases where the coccidia pass into the middle ear, the semicircular canals become involved, causing the head to be carried to one side, staggering gait, and in some cases rolling over and over. Spasms of the muscles occur followed by paralysis. Paralysis, however, is a symptom of many irritating conditions in rabbits which in other animals ordinarily cause excitement. Later a profuse diarrhea is noticed followed rapidly by exhaustion and death.

Diagnosis.—Microscopic examination of the nasal discharges reveals the presence of the coccidia.

Prognosis.—Unfavorable.

Treatment.—The nasal passages, eyes and mouth are cleansed with antiseptic solutions and astringents (boric acid 2 per cent, zinc sulfate, 1 per cent, copper sulfate 1 per cent, creolin 2 per cent). Small doses of sulfur (0.1 to 0.2) may be given every four to six hours to produce antiseptic and laxative action.

Prevention.—(See Infectious Nasal Catarrh of Rabbits.)

CHRONIC NASAL CATARRH

Chronic Coryza—Chronic Rhinitis

Definition.—A chronic inflammatory condition of the mucous membrane of the nasal passages with a mucopurulent discharge.

Etiology.—Usually follows repeated attacks of acute nasal catarrh; ordinary infection; tumor.

Pathology.—(a) In the productive or hypertrophic form there is a generalized infiltration of the mucosa, particularly that covering the lower portion of the turbinated bones, which leads to a more or less extensive thickening of the mucous membrane. The mucous glands increase in size, there is a thick, viscid secretion, and the nasal passages become obstructed by enlargement of the lower part of the turbinated bones. The atrophic form follows the course of the hypertrophic. The hyperplastic tissue atrophies, the epithelium of the mucosa and the glands is destroyed, and there is a collection of a yellowish, purulent material on the surface of the mucous membrane. (b) The discharge from the nasal passages contains bacteria, leukocytes, red corpuscles and epithelial cells.

Symptoms.—A purulent discharge varying in quantity from both nasal passages. This discharge in severe cases is streaked with blood and has a very offensive odor; it causes excoriations on the mucous membrane and skin at the nasal openings, where it dries and forms hard crusts. There are frequent paroxysms of sneezing. In cases where the nasal passages are occluded the animal breathes through its mouth. In some cases where infection is severe general symptoms of loss of appetite, dulness and emaciation will be noted.

Diagnosis.—The presence of the nasal discharge, the chronic course and the mild general symptoms in severe cases.

Prognosis.—Not so favorable as acute nasal catarrh. It requires several weeks for a complete disappearance of the symptoms.

Treatment.—*Hygienic.*—The animal should be kept in a warm place free from all irritating materials which might affect the nasal mucous membrane.

Medical.—The nasal passages should be sprayed daily with eucalyptol (2 per cent), boric acid (2 per cent), or sodium bicarbonate (2 per cent) solution; the dried crusts may be removed with warm water, and zinc oxide ointment applied to the membranes and skin at the nasal openings. The use of Silver compounds are often of value.

Sera-vaccine.—Cultures may be grown from the nasal discharge, and a standardized autogenic vaccine made. The vaccine is injected subcutaneously every five to seven days until the purulent discharge ceases.

to produce general symptoms. When secondary to chronic nasal catarrh or distemper it is mixed with the secretions.

As small animals lick the nose the amount of hemorrhage is not easily determined.

Prognosis.—The prognosis depends on the character and amount of the hemorrhage. Most cases terminate favorably.

Treatment.—*Medical.*—In mild cases when treatment is necessary use injections of cold water (ice-water) or alum solution (3 per cent) into the nasal passages. In severe cases when hemorrhage is copious and persistent use injections of adrenalin chloride (1 to 1000) solution. Give internally iron and quinine citrate (0.2 to 0.35) three times daily; or adrenalin chloride (1 to 1000) 10 to 20 drops, twice daily. Internal treatment also may be helpful in extreme cases.

Surgical.—When the hemorrhage is continuous and cannot be stopped by medical treatment, it will be necessary to use a tampon made of gauze and saturated in an alum (3 per cent) or tannic acid (3 per cent) solution. They should be inserted with a small flexible probe firmly and carefully as far up the nasal passages as possible. In some cases it will be necessary to use the same kind of a tampon inserted in the posterior part of the nasal passages. This is best accomplished by use of the mouth speculum and a flexible probe bent in the shape of a hook. When a tampon is inserted a free end should be exposed to facilitate removal. As small animals breathe freely through the mouth tampons may be inserted in both nasal passages.

PARASITES OF THE NASAL PASSAGES

Definition.—Infestation of the nasal passages and chambers by the *Linguatula serrata*.

Etiology.—*History.*—The infection of the dog with this parasite is rather rare in the United States. Only a few cases have been recorded, but in other countries (France, Germany) they are frequently found. The *Linguatula serrata* are white, the body lanceolated, elongated, vermiform and flattened above and below, the ventral surface nearly plane, the dorsal surface rounded, anterior extremity broad and rounded, posterior extremity attenuated. The thorax is short and between it and the abdomen there is no distinct boundary. The integuments show about ninety rings or segments, widest in their middle, causing the margins of the parasite to be distinctly crenated. The hooks are sharp, curved, and bi-articulated. Each hook is retractile into a small sheath and is moved by muscular cords arranged in different directions. The mouth is rounded, digestive tube rectilinear. Size: male, 18 to 20 mm. long, 3 mm. broad in front and 0.5 mm. behind; female, 8 to 10 cm. long, 8 to 10 mm. broad in front and 2 mm. behind. The eggs are ovoid, 90 microns long and 70 microns broad.

The life cycle of the *Linguatula serrata* is as follows: the female deposits her eggs in the nasal passages of the dog; the eggs are expelled by sneezing and being surrounded by mucus, they adhere to grasses or whatever they happen to come in contact with. The grasses are eaten by any of the herbivorous animals. The shells of the eggs are dissolved by the gastric juice and the embryos are set at liberty in the intestinal tract. Each embryo is provided with a median stylet and two curved hooks with which

it penetrates the walls of the intestines and reaches the peritoneum, mesenteric glands, liver and the lungs where it becomes encysted. During the period of encystment in the organs and glands the embryo undergoes successive changes in its development and becomes a larva. The larvæ migrate by means of their hooks and the sharp spiculæ on their skin. Some of them pass into the bronchi and trachea reaching the nasal passages where they develop into the perfect parasite. Dogs become infested by eating the viscera of animals containing the larval form which passes from the stomach *via* the esophagus to the nasal passages where it develops.

Necropsy.—In the early stages of the invasion of the *Linguatula serrata* they attach themselves to the mucous membrane of the nasal cavities producing an acute inflammation. The exudate is increased in quantity and later is mixed with pus covering the surface of the mucous membrane

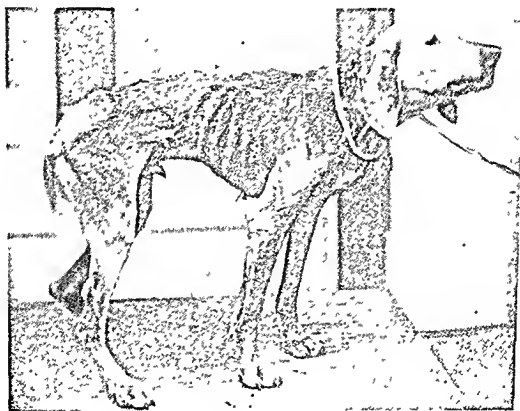


FIG. 1.—*Linguatula serrata*.

which becomes greatly thickened especially around the turbinated bones and in the nasal chambers. In the later stages necrosis of the turbinated bones and nasal septum may take place.

The discharge from the nasal passages often contains the parasites, pus, epithelial cells and large numbers of the ovoid eggs.

Symptoms.—In the early stages the symptoms are paroxysms of sneezing; obstruction of the nasal passages; a discharge which is at first serous, later becomes mucopurulent, mixed with blood, and has a very offensive odor. Accumulations of the dried discharge form crusts at the nasal openings. In animals of a nervous temperament symptoms of excitement are noted from reflex irritation of the nasal passages. Severe hemorrhage is seen from the necrosis opening blood-vessels. Depression, anemia, emaciation and general unthriftiness are sometimes present.

Diagnosis.—The presence of the parasites or ova in the nasal discharge.

Prognosis.—Depends upon the number of parasites and the probability of becoming reinfected.

Treatment.—*Medical.*—Inhalations of small amounts of chloroform, turpentine, or some other volatile oils. Spray the passages twice daily with creolin (2 per cent), carbolic acid (2 per cent), or boric acid (2 per cent) solution. Remove the crusts from around the nasal openings with warm creolin solution and apply zinc oxide ointment to the excoriated membrane and skin. Give internally tincture nux vomica (0.3 to 0.65) daily; iron and quinine citrate (0.2 to 0.4) daily.

Surgical.—Irrigation of the nasal passages with a warm solution of creolin (2 per cent). This can be done by using a small, soft rubber tube inserted as high up in the nasal passages as possible. Attach a funnel to the other end and pour the solution slowly into it using only a small quantity of the fluid. The nasal passages can also be irrigated through the posterior nares by the use of a hard nozzle bent in the form of a hook. Depress the head and allow the fluid to flow out through the nasal passages.

NEOPLASMS OF THE NASAL PASSAGES

Papillomata.—These are benign tumors having a framework of fibrous tissue and blood-vessels covered by squamous epithelium. The surface of the tumor is roughened by many elevations and proliferations. Papillomata are most commonly located around the margins of the nasal openings and especially at the juncture of the skin and mucous membrane. Sometimes they extend a short distance up the nasal passages and may extend to the skin of the lips and the nose. They are found here in two forms: (a) a hard form which presents smooth, rounded elevations on the skin; (b) a soft form, which is pedunculated, has an irregular, broad surface and cauliflower-like appearance. The soft tumors are found on the mucous membrane. In size they vary from that of a millet seed to a walnut. There may be a large number or only a few present.

Treatment.—*Surgical.*—They are removed as follows: the animal should be given an anesthetic (morphine subcutaneously, or ether inhalation). Sterilize curved scissors, forceps and artery forceps; clean the surface of the skin, mucous membrane and tumors with boric acid solution (2 per cent). Grasp the tumor with the forceps and cut off with the scissors, and if the hemorrhage is persistent use the artery forceps. Alum (2 per cent) or silver nitrate solution (0.25 to 0.5) may afterward be applied. The after-treatment consists in washing the surface where the tumors are removed with antiseptic solutions.

Polypoid Fibromata.—These occur as enlargements on the mucous membrane of the nasal passages and frequently interfere with breathing, producing complete obstruction of one or both passages.

Treatment.—These are best removed with a fine wire snare. Inject astringent solutions (alum 2 per cent) up the nasal passages to control the hemorrhage. When this method of removal fails it is best to trephine the superior wall of the nasal passages and extirpate the tumor through the opening. After-treatment consists of warm antiseptic solutions injected daily up the passages.

Malignant Tumors.—Occasionally in the nasal passages are found epitheliomata, osteosarcomata, and sarcomata which are usually secondary to primary growths having their origin in the buccal mucosa, maxillary bones or lips (epitheliomata).

Symptoms.—Malignant growths give rise to distortions of the nasal bones, lips and often result in necrosis of the parts involved. The nasal discharge will contain necrotic material and blood and has a very offensive odor.

Diagnosis.—To make an accurate diagnosis some of the tumors should be obtained and examined microscopically.

Prognosis.—The prognosis is very unfavorable.

Treatment.—Owing to the location of the tumors, their malignant character and the tissues involved, treatment is not to be attempted.

CHAPTER II

DISEASES OF THE LARYNX

Examination.—(a) With the mouth speculum, laryngoscope and good light, the anterior portion of the larynx and the surrounding tissues can be readily inspected provided the tongue is depressed or drawn well forward.

(b) By examining some of the nasal discharge collected with a dressing forceps carrying a pledget of cotton, its character is decided.

(c) By palpation, enlargements, injuries and the degree of sensitiveness may be determined.

LARYNGITIS

Two forms of laryngitis are frequently observed in small animals, viz.: (a) acute, and (b) chronic.

Acute Laryngitis.—**Definition.**—An acute catarrhal inflammation of the mucous membrane of the larynx.

Etiology.—(a) Excessive use of the voice (barking). This is often seen at dog shows; in hounds after hunting; in some dogs when penned up or tied; during the course of rabies; the nervous form of distemper, and excitement due to any cause.

(b) Inhalations of dust, dirt, etc.; injuries (tight collars, etc.). Inhalations of gases and smoke; irritating drugs and chemicals.

(c) Exposure to cold.

(d) Infections (staphylococcus, etc.) and during the course of infectious diseases (rabies, distemper, etc.).

(e) Extension of inflammation from adjacent parts.

Pathology.—(a) There is an acute inflammation of the mucous membrane which, in the early stages, is covered by a thin serous exudate which later becomes turbid from admixture of leukocytes. From the irritation produced by coughing, small quantities of blood are often raised. When infection is present the secretions are mucopurulent in character.

(b) The discharge contains bacteria, leukocytes, red corpuscles and epithelial cells.

Symptoms.—Hoarseness, change of voice, frequent attempts at deglutition, a harsh, dry cough which later become softer and moist as the secretions are increased. The mucous membranes are congested and swollen. Pressure on the larynx, exercise, excitement or drinking cold water induces coughing. General symptoms are rare. The larynx is very sensitive on palpation.

Diagnosis.—The presence of the harsh, dry cough which is aggravated by exercise and excitement and the absence of general disturbance are characteristic of laryngitis.

Prognosis.—Favorable. Recovery usually follows in eight to ten days, unless when secondary to rabies, distemper, etc.

Treatment.—*Hygienic.*—Keep warm; supply plenty of fresh air.

Dietetic.—Give warm milk and warm liquid foods.

Medical.—Direct application of medicinal preparations to the mucous membrane is unpracticable and of little value. The following formula should be used to allay irritation and stop the coughing:

R—Morphini hydrochlorati	0.1
Aquæ amygdalæ amaræ	30.0

Misce et fiat solutio.

Sig.—Give teaspoonful three times daily.

Surgical.—Apply Priessnitz compress or hot antiphlogistine pack over the larynx. Renew twice daily.

Chronic Laryngitis.—**Definition.**—A chronic catarrhal inflammation of the mucosa and submucosa of the larynx.

Etiology.—This is usually the result of frequent acute attacks, and therefore the causes enumerated under acute laryngitis are applicable to the chronic form. Chronic laryngitis is often the result of the extension of chronic nasal and pharyngeal catarrh; the presence of papillomata and polypoid fibromata within the larynx; as a sequel to distemper; may be caused by pressure on the vagus nerve (enlarged mediastinal lymph glands, sarcomata, carcinomata, etc.); to direct irritation of the mucosa by malignant growths; enlarged thyroids.

Pathology.—Chronic catarrh leads to hyperemia of the parts with hypertrophy of the mucosa and the submucosa, together with fibrous tissue proliferation. Localized thickenings, either flat or wart-like, are often noticed. The submucosa is infiltrated with cells and the mucous glands are swollen and distinct, producing a granular condition.

Symptoms.—The symptoms are somewhat similar to those of acute laryngitis but not so severe and continue for a longer time. The cough is hoarse, dry, seldom moist, and is aggravated by exposure to cold, exercise or excitement. The larynx is less sensitive than in the acute form when examined by external manipulation. After severe attacks of coughing the patients may show nausea and vomiting.

Diagnosis.—The chronic course, absence of general symptoms and the cough characterize the condition.

Prognosis.—Owing to the changes in the mucosa and the submucosa, improvement is slow and complete recovery seldom takes place.

Treatment.—*Hygienic.*—Keep warm; supply plenty of fresh air.

Dietetic.—Give warm liquid foods (milks, soups, etc.).

Medical.—The following formulæ may be used to stop the coughing and allay the irritation.

R—Morphini sulfatis

0 1

R—Apomorphin. hydrochloras	0 05
Acidi hydrochlorici	1.0
Aquæ destillata	250 0

Misce et fiat solutio.

Sig.—Give teaspoonful twice daily.

Syrup of tar or syrup of wild cherry may be given in teaspoonful doses twice daily.

Inhalations of medicinal preparations (turpentine, compound tincture of benzoin, etc.) and direct applications (silver nitrate 1, glycerin 130) may be used in some of the more obstinate cases.

CHAPTER III

DISEASES OF THE TRACHEA AND BRONCHIAL TUBES

Examination.—(a) By palpation, the upper part of the trachea can be examined for enlargements, deformities of the tracheal rings, constrictions and sensitiveness to pressure. Often when inflammatory conditions are present, slight pressure on the trachea will induce coughing; attempts at swallowing and considerable uneasiness and pain.

(b) By auscultation, the condition of the mucous membrane and the character of the secretions can be determined. The tracheal and bronchial sounds are most distinct at the entrance of the trachea to the thorax. A phonendoscope held directly against the trachea at this point will greatly assist in the examination.

ACUTE TRACHEITIS AND BRONCHITIS

Definition.—These are acute inflammatory conditions involving the mucous membrane of the trachea and the bronchial tubes.

Etiology.—(a) Small particles of foreign bodies (dust, etc.) enter the trachea and bronchial tubes producing excoriations and congestion of the mucous membrane which allow infection to take place. If these substances are putrescent a fetid bronchitis will be produced.

(b) Irritating gases (ammonia, etc.) and the fumes of acids (carbolic, etc.) may excite an attack of bronchitis by direct irritation to the mucous membrane. When inhaled in concentrated form and in large quantities they will induce inflammation extending into the small bronchioles, producing an acute capillary bronchitis. The excretion of toxic substances by the bronchial mucosa causes a rapid proliferation of the surface and granular epithelium of the mucous membrane and an increased secretion of mucus. The epithelium of the mucous membrane becomes more embryonal in character and therefore less resistant to the invasion of microorganisms. At the same time these organisms, ordinarily present, multiply more rapidly and increase in virulence, and unless the process is arrested a bronchitis is soon established. Some drugs (iodine, bromine, etc.) when administered in large doses and continued for quite a time may be excreted in sufficient quantities to produce an acute bronchitis.

(c) Inhalations of smoke containing various gases and particles of foreign material will irritate the mucous membrane of the entire respiratory tract, frequently resulting in an active congestion and later in inflammation of the mucous membrane which favors the growth and development of the infection which is always present.

(d) Acute bronchitis develops frequently as a secondary disease following specific infections (distemper, etc.). The specific infection reduces the normal resistance of the mucous membrane thus allowing the secondary infection (staphylococcus, streptococcus) to develop rapidly and produce the disease.

(e) Parasitic. In severe infections of the *Ancylostoma canina*, the larval form of this parasite, in its migrations through the body, often burrows

along or through the walls of the bronchi and trachea producing an inflammation of the mucous membrane and the underlying tissues. (See Ancylostomiasis.) *Oslerus osleri* are occasionally found in the trachea and bronchi. They occur in or beneath the mucosa and cause formation of small nodules.

(f) Tracheitis and acute bronchitis are often consecutive to inflammations of the nasal passages, larynx and pharynx. The infection is carried to the trachea and bronchi by inhalation where it develops, producing the inflammation.

(g) Other diseases (renal affections, endocarditis, diabetes, carcinoma and sarcoma, valvular insufficiency) produce a disturbance of the heart action, enfeeblement of the vasomotor nerve and reduce the resistance of the mucous membrane.

It is quite evident that acute tracheitis and bronchitis in most cases develop from bacteria found normally on the mucous membrane.

Pathology.—The pathological changes that are liable to be found in acute tracheitis and bronchitis are somewhat diverse, the details of the process being considerably modified by the anatomical peculiarities of the parts affected and the different causes that affect them. The inflammation may be restricted to the bronchial structure but is frequently associated with other and more serious disturbances. The condition is usually bilateral, although certain parts are affected more than others. Tracheitis and bronchitis are often associated with laryngitis, peribronchitis and bronchopneumonia.

Symptoms.—*Cough.*—This is the most important symptom and is never absent, although it may be slight or very severe and loud, occurring as isolated coughs succeeding each other with greater or less frequency, or in paroxysms which often end in nausea or vomiting. The cough is dry and harsh in the early stages, later becoming moist as the inflamed mucous membranes produce an increased secretion. Paroxysms of coughing are often induced by excitement (visits of the owner, etc.), exposure to cold, moist air, pressure over the lower part of the trachea or by percussion over the sides of the chest. The object of the cough is to expel the accumulated discharge from the air passages.

Discharge.—This is always present except in the early stages; it is mucous at first, becoming mucopurulent or purulent as the disease progresses. In small animals the discharge is expelled from the trachea and bronchi directly into the mouth and swallowed. Therefore it is impossible to determine the amount and character, and it becomes necessary to observe the animal while coughing to ascertain the condition of the discharge.

Dyspnea.—The degree of dyspnea depends on the obstruction of the free movement of air through the bronchial tubes. In mild cases it may not be noticed but in other cases, in which the caliber of the bronchi is materially decreased by the swelling of the mucous membrane, it may be quite distressing.

General Symptoms.—Moderate temperature (rise of 1° to 2° F.), pulse quickened, partial loss of appetite and increased thirst. In severe cases, there is complete loss of appetite, high temperature (104° to 105° F.) and general depression. On percussion nothing abnormal is noted, except in cases where the bronchioles are affected and filled with an exudate where there may be local areas of dullness.

Auscultation.—In mild cases the vesicular sound is increased. In well marked cases the respiratory sounds are harsh with some lengthening of expiration. Absence of sound may be found when obstruction of the bronchi or collapse of lobules occurs. Sibilant and sonorous sounds are typical signs which are due to the irregular narrowing of the caliber of the large and small bronchi respectively. As the secretion becomes more liquid, moist râles are produced in the tubes due to the liquid being driven back and forth by the air currents. The volume of the râle is in proportion to the size of the tube in which it originates. Large, moist, bubbling râles are produced in the large bronchi, and the small, moist râles arise in the smaller tubes.

Diagnosis.—From the character of the cough, auscultation and general symptoms one may readily detect the presence of acute tracheitis and bronchitis. Careful examination of the animal should be made, however, to determine if the disease is primary or secondary.

Prognosis.—Favorable in most primary cases; when secondary to other diseases the prognosis is not so favorable. In primary cases, the course is usually eight to fourteen days; in secondary it is much longer.

Treatment.—*Hygienic.*—The animal must be kept in a warm place (70° F.) having good ventilation but direct currents of cold air must not reach it.

Dietetic.—Light, soft or liquid foods should be used (milk, extract of beef, soups or small amounts of raw or cooked beef). In cases where the animal will not eat, it should be given raw milk to which raw eggs have been added.

Medical.—For the appetite use compound tincture of gentian (0.8 to 2) or tincture of nux vomica (0.3 to 0.6). In the early stages while the cough is dry and harsh, expectorant formulæ should be used to stimulate the secretion of the mucous membrane, as:

R—Ammonii chloridi	5 0
Extract. glycyrrhizæ	10 0
Aquæ	150 0
Misce et fiat solutio.	
Sig.—Give a teaspoonful three times a day.	

or

R—Apomorphini hydrochlorati	0 02
Acidi hydrochlorati	1 00
Aquæ destillata	150 00
Misce et fiat solutio.	
Sig.—Give a teaspoonful four times a day.	

When severe cough is present, sedatives should be given to reduce the irritation to the nerve endings in the mucous membrane, in the following formula:

R—Morphini sulfatis	0 2
Aquæ amygdalæ amaræ	20 0
Aquæ	150 0
Misce et fiat solutio.	
Sig.—Give teaspoonful every three hours	

Counterirritants (oil of mustard and glycerin 1 to 20) may be applied to the walls of the thorax to stimulate the enervation and circulation in the trachea and bronchi.

Inhalations of antiseptics and stimulants (oil of turpentine, oil of tar, creolin, etc.) may be used. These are best administered by adding them to hot water and allowing the animal to inhale the vapor.

In the treatment of this disease the predisposing causes should be considered more than the infection as antiseptics cannot be applied to produce thorough antiseptic action on the mucous membrane.

CHRONIC TRACHEITIS AND BRONCHITIS

Definition.—This is a chronic inflammation of the mucous membrane of the trachea and bronchial tubes.

Etiology.—Chronic tracheitis and bronchitis may occur independently or secondary to some other disease. It may originate from any of the causes of acute tracheitis and bronchitis, especially when their action is persistent or frequently repeated. The common causes are:

- (a) Continued inhalation of irritating dust, dirt, etc.
- (b) Exposure to cold, damp air (as keeping animals in cold, damp basements having poor ventilation).

(c) Parasitic. In severe infections with *Ancylostoma canina*, when the animal is being constantly reinfected, the passage of the larvæ through the tracheal and bronchial structure produces a chronic irritation. (See *Ancylostomiasis*). Infections with *Dirofilaria immitis* often produces this condition. Chronic tracheitis and bronchitis often result from the gradual extension of the inflammatory process from the other parts (laryngitis, pharyngitis, etc.). Many cases are secondary to special diseases such as distemper, carcinoma, sarcoma, rachitis and acute valvular insufficiency.

Pathology.—Chronic tracheitis and bronchitis are practically always purulent, and while in most particulars it closely resembles the acute form, it differs from it in the presence of a more deeply penetrating inflammation and in the production of fibrous tissue. The mucous membrane is swollen, reddened, infiltrated, and covered with purulent secretion. The walls of the bronchi are hypertrophic. Not infrequently the mucosa is thrown into little polypoid excrescences, due partly to contraction and partly to fibrous proliferation. The walls of the bronchi become thickened and there is often a fibrous peribronchitis, which in time may lead to induration of the lungs.

Symptoms.—This condition is most common in old animals where it frequently interferes with respiration producing so-called asthma. The most prominent symptom of this disease is the cough. It is usually moist, varying in intensity, depending upon the amount of secretion and extent of mucous membrane involved. Excitement frequently produces paroxysms of coughing which are often attended by severe nausea and vomiting. In cases secondary to other diseases the cough is modified becoming short, isolated and more spasmodic. This is particularly so in chronic bronchitis due to the parasite, *Ancylostoma canina*, and to valvular insufficiency of the heart. The discharge is mucopurulent in character, and is usually swallowed, but during paroxysms of coughing some of it mixed with mucus will be expelled from the mouth. In severe cases when the discharge is decomposed by putrefactive organisms there is a very offensive odor given off with the exhaled air.

Dyspnea.—This is always present to some extent; in old animals it is well marked. The dyspnea results from the emphysema and interstitial pulmonary fibrosis which always develops, and, when secretion is present

large amounts, the dyspnea is increased accordingly, producing asthmatic conditions. On auscultation there are sibilant or there may be moist râles, depending on the condition of the membranes and the character and quantity of the secretion. Vesicular sounds are increased. Percussion usually gives negative results, and only in the more severe cases are the general symptoms of emaciation, loss of appetite, etc., noted.

Diagnosis.—The long continued course of the disease, the age of the animal, the absence of general symptoms in most cases and the characteristic cough are indicative.

Prognosis.—In most cases of chronic tracheitis and bronchitis the prognosis should be considered unfavorable as complete recovery seldom takes place. During the warm, dry months the symptoms often subside only to reappear with the return of the cold, damp weather.

Treatment.—Symptomatic treatment can be used to alleviate the cough and to modify the secretions. Keep the animal quiet, avoid exercise and protect from sudden changes in temperature. The following formulæ may be used:

R—Apomorphinæ hydrochlorati	0 03
Syrupus pruni virginianæ	60 00
Syrupus picis liquidæ	120 00

Misce et fiat solutio.

Sig.—Give teaspoonful three times daily.

R—Acidæ benzoici	0 4
Sacchari albæ	4 0

Misce et fiat pulvis No. XX.

Sig.—Give a powder morning and evening.

In general debilitated conditions tonics and alteratives should be used as in the following formula:

R—Ferri et quinini citratis	10 0
Syrupi	90 0

Misce et fiat solutio.

Sig.—Give a teaspoonful once daily.

R—Tincture nucis vomicæ	7 0
Tincture gentianæ	10 0
Aquæ	60 0

Misce et fiat solutio.

Sig.—Give teaspoonful once daily.

Daily inhalations of medicated vapors (turpentine, eucalypti, etc.) are valuable to stimulate the secretions and assist in their removal. The use of the inductotherm in obstinate cases seems to give very satisfactory results.

CHAPTER IV

DISEASES OF THE LUNGS

Examination.—The following things are essential for a complete and thorough examination:

1. The number and character of the respiratory movements.
2. The size, shape and sensitiveness of the thorax.
3. Auscultation.
4. Percussion.

1. *Respiration.*—In small animals the number of respiratory movements normally varies greatly. The average number while at rest is 12 to 24 per minute. This is easily and quickly increased by excitement and exercise until they may reach 60 to 90 per minute. During warm weather even while at rest the respirations are greatly accelerated, owing to the skin glands not being active enough to assist in the respiratory function. In order to overcome this physiological condition the animal breathes forcibly through the mouth, and the frequency of respirations is increased. Respiratory movements are also increased in the following diseased conditions: catarrhal pneumonia, foreign body pneumonia, chronic interstitial pneumonia, usually when the temperature is elevated, in laryngitis, acute and chronic bronchitis, hydrothorax, pleurodynia, ascites, peritonitis, valvular insufficiencies, eclampsia and during the early stages of some poisonings. A lessening in the number of respirations is found in narcotic poisoning, diseases of the brain and its membranes and in the later stages of infectious diseases, septicæmia and pyæmia.

2. *The Thorax.*—In shape both sides of the chest wall should be symmetrical. Depression on one side indicates fractured ribs or pleurodynia. Distention of the thorax is seen in hydrothorax, and in fluid accumulations (ascites), tumors or when the stomach is distended, causing pressure against the diaphragm.

3. *Auscultation.*—Auscultation is practised by using the phonendoscope or by covering the thoracic wall with a piece of cloth against which the ear is placed. With the phonendoscope the sounds are made more audible and distinct.

The normal sounds of the lungs are: (a) the vesicular; (b) bronchial, and (c) the expiratory. (a) The vesicular sound normally is a soft, regular, blowing sound caused by the air passing into the alveoli and distending them. It is most distinct in emaciated animals and where the lung tissue is in close contact with the thoracic walls. It is normally increased by excitement or exercise and is always more distinct in puppies than in older dogs. The vesicular sound is modified in the following pathological conditions: increased in dyspnea in the healthy portion of the lung, in tracheitis and in bronchitis; decreased in stenosis of the upper air passages; in certain stages of catarrhal pneumonia; emphysema of the lungs; hydrothorax; swelling and thickening of the skin and muscles of the thorax and in certain poisonings.

(b) Bronchial respiratory sounds are best recognized by placing the phonendoscope directly over the trachea at its entrance to the chest.

These sounds are normal in the larynx and trachea, but their appearance in the thorax is significant of disease. Bronchial respiratory sounds are increased by secretions in the smaller bronchi, as in catarrhal pneumonia; compression of the lungs by pleuritic exudate; laryngitis, tracheitis and bronchitis.

Irregular bronchial sounds are caused by the secretions being carried to and fro by the passage of the air. They are dry (wheezing) where there is a small quantity of mucus adherent to the mucous membrane. These sounds (wheezing) occur mostly in the smaller bronchi, while the moist, bubbling râles (sonorous) emanate from the larger bronchi where they are produced by the collection of secretions. Cavities in the lungs also produce them. Bronchial sounds are important in determining the existence, extent and character of tracheitis and bronchitis. When sibilant (wheezing) sounds are prominent it indicates that the infection extends into the bronchioles.

(c) Expiratory sounds are produced by the rapid expulsion of air from the lungs, and in normal conditions are hardly perceptible, except in puppies. This sound is increased by excitement, exercise, etc. In some diseases it is varied in tone, becoming louder and more prolonged.

4. *Percussion*.—This is performed by the use of the percussion hammer and pleximeter or by the fingers of one hand placed against the chest wall and tapped with the fingers of the other hand. The normal sounds of a healthy lung are heard all over the thorax, the volume of sound depending on the thickness of the lung at the particular part being examined. The normal sound is clear, loud and resonant as distinguished from the tympanitic, dull or solid sound of disease. Tympanitic sounds are heard in the following conditions: (a) emphysema, (b) pneumothorax, (c) cavities in the lungs, (d) in collapse of the pulmonary tissue from a retraction of the lungs in the presence of pleuritic exudates. The collapsed lung floats upon the surface of the fluid above the line of dulness and on percussion emits a tympanitic sound. (e) In the first and last stages of pneumonias. Dull or flat sounds are heard over hepatized areas of the lungs, chronic interstitial pneumonia; tumors in the lungs, and hydrothorax.

CONGESTION OF THE LUNGS

Hyperemia of the Lungs

Definition.—An excessive or abnormal accumulation of blood in the lungs. Hyperemia may be either active or passive.

Active Congestion.—**Etiology.**—It is found in the early stages of all inflammatory conditions of the lungs and pleura. Occasionally it may be due to inhalations of irritating gases, smoke, acid fumes, etc., or may result from cold.

three or four days. Owing to the aëration of the lungs being diminished the visible mucous membranes become cyanotic. On auscultation the respiratory sounds will be increased, harsh and rough, and râles of various kinds may be heard. At the base of the lung fine crepitant or subcrepitant râles may be distinctly audible, while over other parts sibilant or sonorous râles may be heard. Percussion reveals only slight dulness.

Diagnosis.—Active congestion of the lungs in the beginning possesses no distinctive characteristics, but resembles bronchopneumonia. As it progresses it will be readily distinguished from this condition by the absence of hepatization and the occurrence of the crisis on the fourth or fifth day.

Prognosis.—Usually favorable but in some cases pulmonary edema with fatal results, or pneumonia may develop. The affection is always to be looked upon as serious and one demanding active treatment.

Treatment.—*Hygienic.*—The animal must be kept in a warm place and it is important that it be well ventilated.

Dietetic.—Give warm liquid foods (milk, beef tea, soups, etc.).

Medical.—Magnesium sulfate (8 to 10 grams in cold water) should be used as a hydragogue purgative. To equalize the circulation tincture of aconite (0.01 to 0.1) or veratrum viride (0.1 to 0.2) is beneficial and can be given every three to five hours if necessary. Oil of mustard and glycerin (1 to 20) can be applied to the walls of the thorax as a counterirritant.

When the initial intensity of the symptoms yields, then a stimulating expectorant as ammonium chloride should be used as follows:

R—Ammonii chloridi	5.0
Extract. glycyrrhizæ	10.0
Aquæ	150 0

Misce et fiat solutio.

Sig.—Give a teaspoonful three times a day.

which will most favorably influence the pulmonary condition. As a heart stimulant the following formula gives good results:

R—Extracti digitalis fluidi	1 0
Syrupus pruni virginianæ	60 0
Misce et fiat solutio.	
Sig.—Give one teaspoonful once a day.	

In addition to this formula strychnine sulfate (0.001 daily) may be used as a general stimulant. To relieve the cough when severe use:

R—Morphini sulfatis	0 1
Aquæ amygdalæ amaræ	30 0
Misce et fiat solutio.	
Sig.—Give a teaspoonful twice daily	

If the animal's condition will permit the use of a hydragogue purgative, magnesium sulfate (8 to 10 grams) is useful to modify the circulation and remove fluid from it. This dose may be repeated in twelve hours if sufficient action has not taken place.

PULMONARY EDEMA

Edema of the Lungs

Definition.—An effusion of serous fluid into the alveoli and interstitial tissue of the lungs.

Etiology.—Diseases of the heart (valvular insufficiency, etc.) are the most frequent predisposing causes of pulmonary edema, although it occurs as a secondary condition to chronic pulmonary congestion, nephritis, cachexia, anemia and infectious diseases (distemper, etc.). In the latter stages of distemper pulmonary edema frequently develops when it is often the immediate cause of death. Edema of the lungs occasionally follows the administration of drugs (pilocarpin, etc.).

Pathology.—The lung is heavier and firmer than normal, pale in color and pits on pressure. When incised a thin serous fluid escapes. This may be clear or if there is congestion present it may be stained with blood. Crepitation is always lessened and small patches may be entirely airless. The bronchi contain a frothy fluid.

Symptoms.—The symptoms develop rapidly except in those cases occurring as the terminal event in exhaustive diseases in which the course is more gradual and the symptoms less pronounced. Severe dyspnea, which becomes worse as the exudate accumulates is an important symptom. The pulse is weak and small, the visible mucous membranes are cyanotic and the extremities cold. A short, feeble cough often accompanies the condition. The temperature is subnormal. There may be a frothy nasal discharge. Upon auscultation various kinds of râles (fine, course or bubbling) will be heard. Percussion reveals diminished normal resonance with occasional small areas of tympany, especially over the posterior part of the lungs.

Diagnosis.—The sudden onset, severe dyspnea and the absence of temperature, accompanied by moist, bubbling râles on auscultation are indicative.

Prognosis.—Always unfavorable, depending upon the cause. Recovery may occur in mild acute cases.

Treatment.—Treatment must be directed first to relieve the edema which threatens the life of the animal, and secondarily to overcome the cause. For the first purpose use counterirritation to the walls of the thorax, oil of mustard and glycerin (1 to 20) or Priesnitz compress (applied hot); also strychnine sulfate (0.001 subcutaneously) as a heart stimulant. Subcutaneous injections of ether (0.8), or camphor (0.1) in ether (0.8) are often useful as prompt stimulants. Atropine (0.002) is of value as a heart stimulant and is especially useful in cases of edema due to pilocarpin, being a physiological antidote.

In the treatment for the removal of the cause digitalis fluidextract (0.1) is most valuable to regulate the heart action. Hydragogue purgation (magnesium sulfate 8. to 12.) will remove fluid from the blood which tends to reduce the exudation of serum into the lungs; also the use of a diuretic (oil of juniper 0.3 to 0.5) for the same purpose in cases of renal disease.

BRONCHOPNEUMONIA

Catarrhal Pneumonia

Definition.—This is an affection of the lungs in which the usual sequence of events is, that an inflammation of the smaller bronchioles in scattered areas is succeeded by the involvement of anatomically related or contiguous vesicles.

Etiology.—(a) The inhalation of foreign material in the form of small particles of dirt, dust, etc., which irritates the mucous membrane and modifies the secretions, favors the development of infection and leads to inflammation of the bronchioles and alveoli.

(b) Irritating chemicals and gases when inhaled produce an active congestion and inflammation of the lungs. However, in most cases when inhaled in large quantities they act as irritants to the mucous membrane and thus favor the development of infection which leads to bronchopneumonia.

(c) Cold, damp, changeable weather is a very important predisposing factor inasmuch as chilling the surface of the animal's body modifies the circulation and the secretions of the mucous membrane, reducing its resistance, as well as the general resistance of the body. This favors the growth of infection which may be already present. The effect of cold, damp weather is well shown by the greater incidence of the disease in the winter and spring months. Young puppies, especially, are quite frequently affected with bronchopneumonia when kept in cold, damp and poorly ventilated kennels.

(d) Bronchopneumonia is frequently secondary to specific infections (distemper, etc.) which reduce the general as well as the local resistance.

(e) Inflammation of other parts of the respiratory system may produce bronchopneumonia by an extension of the inflammation. This is especially true of acute bronchitis which by extension at first produces a capillary bronchitis and later a bronchopneumonia.

(f) During the course of some diseases (nephritis, endocarditis, diabetes, valvular insufficiencies, sarcoma and carcinoma), the heart action is disturbed, the vasomotor nerve is enfeebled, both of which reduce the resistance to infection. Young puppies infested with parasites, which interfere with the general nutrition, frequently develop bronchopneumonia from the reduced resistance to infection.

(g) Infectious material from the mouth and the nasal passages which reach the bronchial tubes and alveoli will produce a bronchopneumonia.

Possibly in no other disease do lessened powers of resistance of the animal, from whatever cause, play such an important part in determining the inception.

Pathology.—The process in bronchopneumonia is associated with bronchitis, and indeed almost always starts with an inflammation of the smaller bronchioles, which then spreads to the adjacent alveoli. The exudate is at first serous and contains a few erythrocytes, but more numerous white cells. There is also a large number of mononuclear cells with clear protoplasm, which are swollen desquamated epithelial cells from the alveolar walls. The disease usually affects both lungs, but may involve only one or even a single lobe or a portion thereof. The affected organ is heavier than normal, somewhat congested, and in its substance can be felt areas of increased consistence. These are friable, of a reddish-gray, gray or grayish-yellow color, contrasting somewhat with the rest of the lung.

On pressure a turbid fluid can be expressed, in which can be seen small particles of a gray, grayish-yellow, or purulent appearance. From the sporadic distribution of the consolidated areas, the term "splenization" has been given to the condition. On section of the lung, both red and gray stages are recognized. The smaller bronchi and bronchioles show inflammation and are filled with exudate. In the alveolar spaces the exudate consists mainly of serum, a few red cells, abundant leukocytes and desquamated cells. The latter frequently contain pigment and bacteria. In the form due to inhalation of infective material, or foreign bodies, the exudate is usually purulent. Such a condition leads to a diffuse purulent infiltration of the lungs and abscess formation. Occasionally gangrene of some of the lung tissue will be noted. This is especially true in weak and debilitated animals with general circulatory disturbance.

Symptoms.—The symptoms of primary bronchopneumonia develop rapidly, usually beginning with a chill and the animal appears depressed and restless. The temperature is high (104° to 105° F.) and falls by crisis. Dyspnea is pronounced, the respirations being short, shallow and very rapid, inflating the cheeks at each expiration. A short painful cough is noticed and the pulse is accelerated (180 to 200 per minute). On auscultation the sounds are mostly those of an acute bronchitis (impairment of the vesicular murmur, moist sibilant or sonorous râles). On percussion dullness is noted where there is a large area of consolidation, while in cases where the consolidated areas are scattered compensatory emphysema may overcome the dullness. In the secondary forms following other diseases (bronchitis, distemper, etc.) the onset is less severe and the symptoms less pronounced. The cough and high temperature may be absent, but if temperature be present it falls by lysis. Dyspnea is usually seen indicating a lack of aëration of the lungs. In the course of this secondary bronchopneumonia the symptoms are not well marked and depend largely upon the primary disease.

Diagnosis.—This is made in the primary form by the sudden onset with severe dyspnea, cough and high temperature, while in the secondary form the symptoms, not being characteristic, the diagnosis is more difficult, depending mostly upon the dyspnea with its attending conditions.

Prognosis.—Unfavorable. In the primary form the prognosis is determined by the extent of the inflammatory process in the lungs, while in the secondary form it depends upon the causative disease, and as this is usually distemper the mortality is high.

Treatment.—*Hygienic.*—The animal should be kept in a warm, well ventilated room free from cold draughts.

Dietetic.—The animal's strength should be sustained by the use of appetizing foods (milk, beef extract, etc.) given warm in small quantities every few hours. During convalescence small amounts of lean meat or other nutritious food may be given three or four times a day.

Medical.—At the onset a purgative should be given (calomel 0.03 and sodium bicarbonate 0.5) to produce free purgation and stimulate the activity of the kidneys. Expectorants are useful to modify and aid in expelling the discharge from the bronchial tubes.

R—Ammonii chloridi	10 0
Extract. glycyrrhizæ	20 0
Aquæ	150 0
Misce et fiat solutio.	
Sig.—Give teaspoonful four times daily.	

Stimulating treatments, such as glucose intravenously, intraperitoneal or orally to prevent dehydration.

Counterirritants to the walls of the thorax in the form of oil of mustard and glycerin (1 to 20) or Priessnitz compress applied hot around the chest. The heart action should be stimulated in severe cases by the use of digitalis fluidextract (0.08 to 0.1) and for general stimulation use strychnine (0.001). Inhalations of medicated vapors (turpentine, oil of tar, eucalypti in hot water) are useful to stimulate the mucous membrane and to produce antiseptic action. Sulfa drugs may also be used to advantage in many cases.

CIRRHOSIS OF THE LUNGS

Chronic Interstitial Pneumonia

Definition.—A chronic inflammatory condition of the lungs characterized by an increase in the interstitial tissue and fibroid collections in the alveoli.

Etiology.—(a) Inhalation of particles of dust when continued for a long period produces fibrosis of the lungs, due to the chronic irritation of the foreign material in the tissues. The degree depends upon the amount and character of the inhaled material.

(b) Pressure upon the lungs by neighboring structures, as new growths and diverticula of the esophagus, tumors in the lung substance, all of which produce a reactive inflammation resulting in increased connective tissue proliferation.

(c) One of the most frequent causes in small animals is bronchopneumonia. When it terminates atypically fibroid changes occur in some of the involved lobules. In these cases the fibrosis begins as a chronic bronchitis or peribronchitis, invading later the surrounding parenchyma of the lung, which results in a great increase in the interstitial tissue. This is a frequent sequel to bronchopneumonia occurring during the course of infectious diseases (distemper, etc.) For some unexplained reason resolution does not occur, and the fibrinous exudate collected in the alveoli during the stage of red hepatization is displaced by fibrous tissue. The connective tissue

formation necessarily begins in the alveolar walls, as from this source must be derived the new vessels which appear in the intra-alveolar new formations. Proliferative changes in the alveolar epithelium may for a time be active during this transformation of the exudate, but eventually the new tissue within the alveoli merges with the thickened, enclosing walls, which take a relatively inactive part in the process, and the area becomes entirely fibroid. Usually this lesion is only in parts of the lobules, but in some cases may extend into a considerable portion of the lung tissue, involving the interstitial connective tissue which is greatly increased in amount.

(d) Localized areas of interstitial pneumonia may originate from abscesses in the lungs, sarcomata and carcinomata, or from inflammatory reactions from the pleura.

Pathology.—Cirrhosis is characterized by the overgrowth of connective tissue in the lungs so that they become hard, traversed by fibrous bands, and more or less shrunken. The condition leads to destruction of the alveolar spaces, sometimes with bronchiectasis, and always to marked impairment of function. When due to lobular pneumonia, which is the common form of pneumonia in small animals, the fibrous tissue production follows the course of the bronchi and bronchioles. The lung is greatly increased in weight, has lost its spongy condition, and is quite hard. On cut surface it shows grayish-white color, and sometimes caseous nodules of necrosis may be seen. In advanced cases the pleura is thickened and the lungs distorted. The two layers of the pleura are often adherent and the mediastinum may be indurated.

Symptoms.—Moderate dyspnea and a chronic cough, with a discharge which may be slight or profuse, and the exhaled air has a fetid odor due to the retention of some of the discharge in the bronchiectatic cavities. The temperature is usually normal and no general symptoms are noticed.

Auscultation reveals increased resonance and bronchial breathing. Percussion yields dulness except where there are saccular dilatations of the bronchi.

Diagnosis.—The history of the case and slow development following bronchopneumonia and the presence of severe dyspnea will materially aid in making the diagnosis.

Prognosis.—Incurable.

Treatment.—Expectorants and general stimulants may be used to modify the symptoms.

FOREIGN BODY PNEUMONIA

Gangrene of the Lungs

Definition.—An inflammation of the lungs due to the inhalation of coarse material which usually results in necrosis of a part or of the entire organ.

Etiology.—(a) Inhalation of foreign material (particles of food from the mouth, especially during anesthesia when vomiting occurs, also when the pharynx and larynx are paralyzed); injury to the lungs from contusions, fractured ribs, penetrating wounds through the thoracic walls or from the esophagus and stomach (swallowed needles, sharp pieces of bone, etc.).

(b) Inhalation of irritant medicinal substances when improperly administered (by closing the nasal openings, pulling the tongue forward or holding the mouth open too wide; holding the head too high or in any posi-

tion which interferes with swallowing, manipulating the larynx or pharynx). All oils, especially mineral, should be given with care.

(c) The causes enumerated above are to be considered as predisposing factors, inasmuch as infection must be present to complete the process. In addition to the ordinary infection, which is normally present in the lungs, putrefactive organisms are necessary to produce gangrene.

Pathology.—The involvement may be either diffuse or circumscribed, usually the latter, and in the form of irregular areas having a brown, greenish or black color. These are dry and surrounded by a zone of congestion and around this a zone of edema. The gangrene is of the moist variety and gives off a very penetrating odor. Cavities may occur in the lungs when the necrotic material is coughed out.

Symptoms.—Dyspnea is pronounced and the expired air has a sweet, fetid odor. The temperature is elevated (104° to 106° F.) and the pulse is small, rapid and very irregular. In the early stages the symptoms are similar to bronchopneumonia, but when cavities appear in the lungs the symptoms rapidly increase in severity. It is at this stage when the odor is a prominent symptom.

Diagnosis.—This rests upon the characteristic odor of the exhaled air, high temperature and the rapid development. The history of the case often assists materially in the diagnosis.

Prognosis.—Very unfavorable. Most cases terminate fatally in a few days.

Treatment.—The animal's strength should be maintained by the use of highly concentrated foods (raw eggs, extract of beef, milk, etc.), given at frequent intervals.

Little can be expected of medical treatment. Inhalations (oil of tar, turpentine, or creolin) may be used to overcome the odor and produce antiseptic action.

In serofibrinous pleuritis there is a large amount of serous as well as fibrinous exudate. It may originate as the fibrinous form, but usually begins with a serous outpouring. This exudate is denser than the transudate seen in hydrothorax, and contains the usual inflammatory products. The amount of fluid will vary with individual cases and in the different small animals from 100 cc. to 5000 cc. When present in large quantities the lung is pushed backward and the neighboring organs pressed upon. This pressure on the lungs of the dog and cat is often sufficient to completely occlude the passage of air into the right posterior lobes.

Hemorrhagic pleuritis is generally the result of infectious diseases and malignant growths on the pleura. The exudate is chiefly serous, with red blood cells present, but at times may be almost pure blood.

Purulent pleuritis (pleuritis purulenta; pyothorax; empyema) is the result of infection by some one of the many pyogenic organisms (staphylococcus, etc.). It may begin as a purulent pleuritis or it may follow infection of the serofibrinous form. In the pleural cavity is found a varying amount of cloudy fluid which contains a great number of pus cells. It may be greenish in color at times, but is usually yellowish. The pleuræ are generally thickened and congested and covered with flakes of fibrin or degenerated endothelium. The pus may be completely absorbed and the two surfaces unite with dense adhesions; or it may become caseated and undergo calcareous infiltration. The changes are most marked in the visceral pleura, which becomes greatly thickened, at first being soft and edematous while fluid is present, but as this disappears it becomes indurated. During the course of purulent pleuritis there is always more or less involvement of the lungs which in some cases may result in pleurogenic pneumonia. In some chronic cases of pleuritis (pleuritis granulosa) there are numerous papilloma-like enlargements distributed over the surface of the pleura, and these by becoming confluent may produce extensive masses which interfere with the function of the neighboring tissues and organs.

The serous exudate contains endothelial cells, white corpuscles and small particles of fibrin. The infected exudate contains numerous pus cells, endothelial cells, and various kinds of detritus. A rather high percentage of albumin is found in the serous exudate.

Symptoms.—In the early stages of pleuritis the symptoms manifest themselves in various ways, depending largely whether the disease is primary or secondary, local or general. In acute, primary pleuritis the disease usually begins abruptly with pronounced general symptoms, viz.: a chill, the animal seeking a warm place, twitching and trembling of the muscles, followed in a few hours with an elevation of temperature (103° to 105° F.) and a small, weak and thready pulse. Cough appears early, is usually dry, and on account of the pain, is partially suppressed. The gait is stiff and they show considerable pain when moved. There is little or no appetite, but as a rule the thirst is intense. The visible mucous membranes are reddened and congested, and in cases where there is much exudation the membranes are cyanotic. Constipation is often noted, the feces being quite dry and hard. The urine, while the exudate is forming, is voided in small quantities and contains albumin. Later as it is absorbed the urine is increased in amount and of very light color.

Dyspnea is quite marked in nearly all cases of pleuritis. In the early stages when the pleura is dry, the respirations are superficial, rapid and

painful, but after exudation takes place they are less painful but labored. When bilateral the animal usually assumes a sitting posture, but when only one side is affected, will lie on the affected side. These positions are assumed to assist in fixing the intercostal muscles to relieve the pain which accompanies the elevation and depression of the ribs. The abdominal type of respiration is used, the elbows being held outwardly and the abdominal muscles and the diaphragm brought into action. There is less expansion on the affected side on account of the pain; when both sides are affected the ribs are held in a fixed position. Palpation of affected parts produces acute pain.

Percussion.—Dulness which gradually rises as the fluid accumulates in the cavity. The upper line of dulness is horizontal and varies with the position of the animal. Above the level of the accumulated fluid tympany will be noted.

Auscultation.—In the early stages when the inflamed membrane is dry, frictional sounds are characteristic and the vesicular murmur is increased, but as the exudate collects the sounds become less distinct or blowing in character, and finally only the bronchial tones will be audible.

In the chronic form all the acute symptoms are modified with slight, if any general disturbance, although the temperature may be variable, changing daily from below to above normal (100° to 103° F.).

Auscultation gives negative results. Pleuritic adhesions cannot be diagnosed during life.

Diagnosis.—The diagnosis depends upon the painful respiration, pain on palpation, abdominal type of respiration, and the presence of fluid in the thoracic cavity. History of injury may also aid materially.

Prognosis.—Usually favorable in mild, acute cases or when local; the generalized purulent forms rarely recover.

Treatment.—*Hygienic.*—It is necessary that the animal be kept in a warm and well ventilated place but free from draughts of cold, moist air.

Dietetic.—Concentrated food should be given three or four times daily, using warm milk, eggs or extract of beef.

Medical.—In the very early stages of pleuritis when the frictional sounds are present, warm glycerin packs to the walls of the thorax are indicated. In addition to this, counterirritants (oil of mustard and alcohol 1 to 20, tincture of cantharides, etc.) could be used to continue the same process. When the cough is severe, narcotic agents (morphine sulfate 0.025 daily) can be used to allay the irritation. Quinine sulfate (0.2 three times daily) may be used to control the temperature and pulse if they become too high. Encourage diuresis by using fluidextract of digitalis (0.1 to 0.2 daily) or diuretin (0.2 to 0.5 three times daily). If constipation be present catharsis may be produced by the use of calomel (0.05 to 0.5 daily) or magnesium sulfate (5. to 10.) to produce a hydragogue action. When fluid is present absorption may be induced by the use of potassium iodide (0.2 to 0.3 three times daily) or pilocarpine (0.005 to 0.1) except in cases of feeble heart action when they must be used sparingly. Pneumonia jacket to maintain normal temperature.

Thoracentesis is performed by the use of a thoroughly sterilized trocar and cannula or aspirating needle. It is best done with the animal in either a sitting or standing position. Remove the hair from and disinfect a small area on the side of the thorax so that the instrument may be inserted (in a forward direction) at the anterior border of the sixth, seventh and eighth ribs and as low in the cavity as possible. The cavity is reached as soon as resistance to the passage of the needle has ceased. The fluid flows out in a continuous stream at first, then synchronous with respiration. After some of the fluid is out, the air may rush in during inspiration, and to prevent this the end of the tube may be immersed in water. If the flow ceases suddenly it is due to plugging with flakes of fibrin which can be forced away by reinsertion of the trocar. The amount of fluid removed depends upon the heart action. When it becomes weak and rapid, or when coughing suddenly develops, the operation should be discontinued. This can be done daily at a different site of puncture until all of the fluid is removed.

HYDROTHORAX

Definition.—A collection of serous fluid in the thoracic cavity without inflammation of the pleura.

Etiology.—This condition always occurs as a secondary process and is a symptom of many affections (insufficiency of the heart; nephritis; chronic diseases of the lungs). It usually accompanies ascites, hydropericardium and edema of the skin; also due to obstruction of vessels (vena azygos); follows a general anemia, hydremia, chronic infectious diseases, carcinoma and sarcoma. These latter diseases damage the endothelium of the vessels and allow the transudation of fluid from them.

Pathology.—The transudate is light or reddish-yellow in color and contains a few flakes of fibrin. If the condition develops very rapidly, the transudate contains many red corpuscles. The specific gravity and albumen content are less than that of blood serum. The pleura may be thickened and pale.

Symptoms.—Hydrothorax develops rapidly and on both sides of the thoracic cavity. Dyspnea results from compression of the lungs. In severe cases this compression may be sufficient to cause edema of the lungs. The temperature is normal. The shape of the chest is unchanged except when a very large quantity of fluid is present causing the lower part of the thorax to be depressed.

Auscultation reveals hard respiratory sounds due to increased respiration. Percussion over the lower part of the chest reveals dullness, the upper level of which changes with the position of the animal. Above this level tympany

PNEUMOTHORAX

Definition.—Air in the pleural sac.

Etiology.—*Mechanical.*—Perforating wounds from the exterior (injuries, exploratory puncture, etc.); perforation through the diaphragm by abscesses of the liver, stomach or esophagus; perforation from the lung by abscesses or rupture of air vessels in the normal lung. Gas-producing organisms (*Bacillus aërogenes capsulatus*) in the pleural exudates are occasional causes.

Pathology.—Pneumothorax rarely occurs by itself, usually being associated with serofibrinous (hydropneumothorax) or infectious pleuritis (pyopneumothorax), due to infection being carried in with the air. A serous or purulent fluid is found in the pleural sacs and the membranes are inflamed.

Symptoms.—Dyspnea is usually quite pronounced, the mucous membrane cyanotic and the pulse rapid and feeble. The physical signs are very distinctive. The affected side shows marked enlargement and the heart-beat is displaced.

On percussion the resonance is usually tympanitic, and depending upon the degree of tension there may be flat tympany, or a full hyperresonant tone like emphysema, while in others with extreme tension dulness will be noticed. There is usually dulness at the lower part due to the effused fluid, which can readily be made to change the level by changing the position of the animal.

On auscultation the normal lung sounds are suppressed in the affected side and exaggerated on the other side, which is very suggestive. The râles have a peculiar metallic sound.

Diagnosis.—The dyspnea, enlargement of the affected side, small amount of effusion in the cavity and cyanotic membranes.

Prognosis.—Depends upon the cause but is usually favorable.

Treatment.—In pneumothorax with extreme tension immediate aspiration (see thoracentesis) should be performed. Penetrating wounds through the thoracic walls should be occluded (adhesive plasters, bandage, etc.) to prevent further entrance of air and infection into the cavity. A small amount of it will be readily absorbed and if infection has not been carried into the cavity recovery will be prompt.

PART II

DISEASES OF THE CIRCULATORY SYSTEM

CHAPTER I

DISEASES OF THE PERICARDIUM

Examination.—An examination of the circulatory system in small animals is of importance in determining diseases affecting primarily the heart and blood-vessels, and also for assisting in the diagnosis of a number of acute infectious and non-infectious diseases.

A systematic examination from a clinical standpoint includes the following: (1) the pulse, and (2) the heart.

1. *The pulse* is best examined in the dog by slightly pressing the femoral artery with the index finger, or the radial artery inside the forearm. In small dogs this is often difficult, and in such cases the hand should be placed against the thorax on the left side just behind the elbow, and at the lower third of the cavity, where the heart-beat is readily distinguished. In cats and rabbits this method is the most satisfactory. A phonendoscope is best used to detect the heart-beats. Clinically we must consider: (a) the frequency, (b) the rhythm or cadence, and (c) the quality of the pulse.

(a) The frequency of the pulse varies considerably in different species of small animals, and also in individual animals of the same species. The size, age, sex, breeding, temperature, time of day, etc., all have a decided influence upon it. The average frequency for small animals is as follows:

	<i>Beats per minute</i>
Dogs	60 to 200
Cats	100 to 180
Rabbits	110 to 140

An abnormal increase in the pulse is found in all elevations of temperature, in severe injuries (fractures of bones, etc.), in mental excitement, valvular defects, severe hemorrhage, and in heart weakness from any cause.

A decrease in frequency, or slow pulse, occurs in the later stages of some poisonings, diseases of the brain (chronic and subacute hydrocephalus), tumors in the brain, icterus gravis, collapse, etc.

(b) The rhythm of the pulse should be regular, especially in cats, and rabbits; in the dog an irregular pulse is found so frequently in apparently healthy animals, that it should not be looked upon as an abnormal condition; in fact, an irregular pulse in the dog is the rule. An irregular or arrhythmic pulse is therefore a physiological condition in some of the small animals. However, in many pathological conditions a pronounced irregularity occurs as, during convalescence from infectious diseases, severe gastro-intestinal disturbances, severe weakness, and in some chronic constitutional diseases. An irregular pulse is observed often after large doses of digitalis.

(c) The quality of the pulse. The pulse-beat should be of equal volume, and it varies with the different species of animal. In all small animals the pulse is rapid, strong and hard. In the dog an unequal pulse is frequently

observed. The pulse is full and distended after exercise, during the early stages of a number of diseases; empty after severe hemorrhage, intense heart weakness and collapse. The pulse is hard and full in severe pain, peritonitis, and acute brain diseases.

The venous pulse is often observed in old dogs and is usually indicative of some chronic heart affection, or general heart weakness.

2. *The Heart*.—This is best examined in small animals, by (a) palpation, (b) percussion, and (c) auscultation.

(a) *Palpation*.—The heart-beat is readily felt in all small animals by placing the hand over the cardiac region (between the fourth and seventh ribs, lower third of thorax on either side). This method of determining the frequency of the heart-beat is practical, especially in very young or small animals, and, as noted, also gives us the frequency of the pulse.

The force of the heart-beat depends largely upon the condition of the animal (emaciated or fat), and whether taken during exercise, excitement or at rest.

The force of the heart-beat is increased in the following conditions:

In hypertrophy of the heart, acute myocarditis, endocarditis, and pericarditis; some poisons, such as aconite and digitalis; after severe exertion or excitement; after considerable loss of blood; where the temperature is elevated. The heart-beat is weakened in the following: degeneration of the heart muscle; the later stages of acute infectious diseases; some poisonings; compression of the heart in hydrothorax, hydropericardium, pneumopericardium; emphysema of the lungs, and in the effusion stage of pleuritis. In unilateral pleuritis the normal force of the beat may be more plainly noted on the healthy than on the diseased side.

(b) *Percussion*.—This is of little value in diagnosis in small animals. The zone of cardiac dullness is between the fourth and seventh ribs. This zone is normally about 2 to 2½ inches in diameter.

The zone of cardiac dullness is increased in hypertrophy of the heart; hydropericardium; tumors and induration of the lungs (chronic interstitial pneumonia). The zone is decreased in emphysema of the lungs and pneumothorax. Pain is observed on percussion in acute pericarditis and myocarditis.

Both of these heart sounds are increased in hypertrophy of the heart, anemias, and thickening of the lung tissue around the heart.

The second or diastolic sound is increased in distention of the arteries, often the result of a congestion of the pulmonary circulation combined with hypertrophy of the heart.

A decrease in the volume of the heart sounds is observed in heart weakness, such as degeneration of the heart muscle, in hydropericardium, and in emphysema of the lung. In many of these cases the heart sounds are imperceptible. In small animals the various heart bruits (abnormal sounds) are often difficult to recognize.

It will require careful and persistent effort on the part of the student to familiarize himself with even the more common bruits which are the following: (1) endocardial, and (2) pericardial.

1. *Endocardial Bruits* are divided into: (a) organic endocardial bruits which are caused either by a narrowing (stenosis) of the valves of the heart, or changes in the valves which interfere with their proper closing (insufficiency). (b) Inorganic endocardial bruits occurring without any particular alteration at the orifices or valves of the heart, and are found in the different forms of anemia in animals.

2. *Pericardial Bruits*.—These bruits consist of friction sounds due to the pericardium becoming rough and dry. These sounds can be distinguished, as they do not occur synchronously with the heart sounds and are often independent of them. They are noted in pericarditis where there is not sufficient fluid to keep the membranes separated. They must be distinguished from pleural friction sounds, and can be quite readily, as they occur entirely independent of the respiratory movements.

From a clinical standpoint, in small animals, further differentiation of the various heart bruits cannot be made.

simple pleuritis; endocarditis, myocarditis, etc. It may also follow diseases of the mediastinal lymph glands, the ribs, sternum, and even in some cases the abdominal viscera. (b) In septic processes, such as suppurating wounds, puerperal septicemia, etc. (c) In specific febrile diseases, such as distemper in the dog and cat, pneumonia, etc.

Necropsy.—On postmortem are recognized: (a) acute fibrinous pericarditis, (b) pericarditis with effusion, and (c) chronic adhesive pericarditis.

(a) *Acute Fibrinous Pericarditis*.—This may be local or general. In the mild form dull, rough, lusterless masses of exudate cover the surface of the pericardium with a thin coating of fibrin which is readily peeled off. In the more severe form the exudate is more abundant, the masses of organized fibrinous deposits giving the surface a rough, shaggy appearance. In this form there is usually found a small quantity of fluid in the meshes of the fibrin. The heart muscle is not affected, except in the more severe form where it will be found pale and turbid.

(b) *Pericarditis with Effusion*.—This effusion may be serofibrinous, hemorrhagic or purulent. It is most commonly serofibrinous. In this case the pericardial surfaces are covered with a thick fibrin and a collection of serous fluid fills the pericardial sac. The hemorrhagic form is usually found in acute cases which have terminated fatally following injuries, etc. The pericardial sac will contain a varying quantity of serous fluid mixed with blood. When pus is present the pericardial surfaces will appear rough, occasionally eroded and of grayish color. This form occurs *via* metastasis or from internal trauma introducing infection into the pericardial sac.

(c) *Chronic Adhesive Pericarditis*.—Chronic adhesive pericarditis is found occasionally on postmortem. It is characterized by marked thickening of the membranes, with adhesions between the membranes themselves, and the adjacent organs.

Diagnosis.—An accurate diagnosis in small animals presents some difficulties, and a thorough examination is always necessary. The frictional tones are characteristic, but they are determinable only in the acute fibrinous pericarditis.

Prognosis—In the milder cases of acute fibrinous pericarditis and serofibrinous pericarditis the prognosis while favorable, should always be guarded at least until the etiological factor can be established. Other forms are always to be considered unfavorable.

Treatment.—*Hygienic.*—The animal should be placed where there is absolute quiet. Prevent excitement, such as by the visits of the owner, or strangers. Have the room moderately warm and well ventilated.

Dietetic.—Nutritious food (lean meat, raw or cooked; milk, etc.) should be given to maintain the general condition of the animal.

Medical.—Heart tonics and stimulants are indicated to tone up the action of the heart, and to assist in the elimination of fluid from the body. Digitalis is of value for this purpose, given to dogs in doses of 0.1 to 0.2 of the fluidextract once or twice daily, depending upon the condition of the patient.

Laxatives (magnesium sulfate 8 to 12 grams, or calomel 0.05 to 0.1) are indicated occasionally to regulate the bowels and also to assist in the elimination of fluids.

Surgical.—When the exudate accumulates to the extent of greatly interfering with the heart action, indicated by dyspnea, small rapid pulse, cyanosis, etc., paracentesis of the pericardium should be performed at once. The operation is not very difficult and is as follows: a rather long, small exploring trocar or aspirating needle is thoroughly sterilized. Shave the hair over the left cardiac region, wash thoroughly with soap and water, and follow with alcohol; then paint the surface with tincture of iodine. The needle should be inserted at the lowest point in the pericardial sac so as to be able to remove all the exudate and lessen the danger of injury to the heart. Insert the needle slightly downward and forward, and not too deep. The fluid will flow out in a steady stream. Repeated operations on successive days are often necessary. The skin wound should be protected by covering with flexible collodion.

HYDROPERICARDIUM

Dropsy of the Pericardium

Definition.—A collection of serous fluid (transudate) in the pericardial sac not due to inflammation.

Etiology.—This condition most often accompanies general hydropsy resulting from valvular defects (insufficiencies), myocarditis, diseases of the coronary arteries, chronic nephritis, etc. It also occurs from pericarditis (see Pericarditis).

Symptoms.—The symptoms are similar to pericarditis (see Pericarditis) except it runs a longer and more chronic course. There is absence of temperature, and frictional bruit is heard on auscultation.

Treatment.—Same as for serofibrinous pericarditis, which see (Pericarditis).

HEMOPERICARDIUM

Definition.—A collection of blood in the pericardial sac.

Etiology.—This condition is found in aneurysm of the aorta, cardiac wall, or coronary arteries, and in rupture and wounds of the heart. Dogs and cats are frequently affected from gunshot wounds, being run over, etc.

Symptoms.—The principal symptoms are those of rapid heart weakness, paleness of the mucous membranes, rapid weakness and in most cases death in a very short time from compression of the heart. In slight hemorrhages the animal may live for several hours or days with a progressive heart weakness, dyspnea and all the physical signs of effusion in the pericardial sac.

Treatment.—Treatment in most cases is impossible, and in the slow progressive cases usually unsatisfactory.

Other diseases of the pericardium, such as pneumopericardium, are of no importance clinically.

CHAPTER II

DISEASES OF THE HEART

VALVULAR INSUFFICIENCY AND STENOSIS

Definition.—A pathological or anatomical defect in the valves and openings of the heart leading to an irregularity in the circulation of the blood. These conditions are very common in small animals, especially the dog, where often quite extensive alterations in the valves are found on autopsy which failed to produce any marked symptom during life. However, when severe forms of insufficiency or stenosis occur, they are characterized by a marked disturbance in the heart action, circulation of the blood and the general condition of the animal. It is often very difficult and sometimes impossible to differentiate clinically between the various valvular and ostial defects which are found on autopsies.

Insufficiency.—In general, this condition occurs in two forms: (a) imperfect closing of the valves which permits a portion of the blood at the contraction of the heart muscle to flow back into the chamber from which it came. This defect may exist in the atrioventricular valves or in the semilunar. Improper closing of the semilunar valve allows a portion of the blood which has been forced into the artery to again return to the chamber during diastole; or imperfect closing of the mitral or tricuspid valves during systole allows a portion of the blood to flow back into the auricles again from whence it came. In the early stages of insufficiency, owing to certain compensatory processes, no marked symptoms will be observed. However, as soon as the heart is not capable of performing the increased labor from lack of nutrition, increased disturbance in the valves, or general weakness from anemia, cachexia, etc., marked disturbance in the general circulation will soon become evident. These are manifested by ascites, dropsical effusions, etc., in different parts of the body.

margins of the valves leading to their imperfect closure. If the chronic inflammations persist it leads to cicatricial contractions (stenoses), and often there are found in long-standing cases in old animals, deposits of calcareous matter on the valves and around the openings.

(b) Dilatation of the heart or weakness of the heart muscle will sometimes affect the openings, the dilatation preventing contact of the valve margins and a complete closure.

(c) Certain poisons and toxins are causes which lead to alterations in the structure and ultimately the action of the valves.

(d) Atheromatous processes may produce the condition. However this is not common in small animals.

(e) Occurs during the course of some diseases, such as anemia, pernicious anemia, etc.

Necropsy.—It has been found that the mitral and aortic valves are the ones most commonly affected in the dog. In the early stages the edges of the valves are slightly thickened and invaded with small nodules. Later are found, as the sclerotic changes increase, contractions of the fibrinous tissue, producing thickening and deformity of the segments of the valves, the edges of which become round, curled and cannot be closed perfectly. In some severe cases the valves become very much thickened, with numerous hard nodules (which may be calcareous), giving them a marked uneven surface. The chordæ tendineæ are often found thickened and contracted. The apices of the papillary muscles frequently show fibrated or calcareous change.

Symptoms.—In small animals the general symptoms of valvular deficiency are of greatest importance from a clinical standpoint, as it is very difficult during the life of the animal to distinguish with any degree of accuracy the separate valvular insufficiencies. However, some of them present some symptoms which are rather characteristic, and therefore, a brief description of the most common ones will be given.

As general symptoms, the following are the principal ones observed which are common to all valvular defects at some period in their course: increased heart action; rapid and irregular pulse; palpitation of the heart; venous pulse (observed in the jugular at its entrance to the thorax); dyspnea; cyanosis of mucous membranes; hydrothorax; ascites; edema along abdomen, pectoral region, extremities; general emaciation, partial or complete loss of appetite with marked digestive disturbance. The condition gradually becomes aggravated until there is a general nutritive disturbance, weakness, and death from exhaustion. Careful auscultation will reveal the valvular insufficiency. Palpation over the cardiac region will determine the irregular and rapid pulse, and often a distinct fremitus. The temperature in the early stages is usually elevated (103° to 104° F.); it later becomes normal or even subnormal as the disease progresses.

Symptoms of insufficiency of the mitral valves: this is of frequent occurrence in the dog. It is often accompanied by dilatation or hypertrophy of the heart. Pulse rapid and irregular; systolic bruit and increase of the diastolic sound on auscultation; dyspnea; cyanosis; general weakness; dropsical conditions (ascites, etc.). A careful examination is necessary to make a differential diagnosis.

The direct effect of aortic insufficiency is the regurgitation of blood from the artery into the ventricle, causing a distention of the cavity and a reduc-

tion of blood-pressure in the artery. The amount returning varies with the size of the opening. This regurgitation eventually leads to dilatation and finally hypertrophy. In this way the valve defect is compensated for, and as with each ventricular contraction a larger amount of blood is forced into the arterial system, the regurgitation of a certain amount for a time during diastole does not interfere with the nutrition or with the general circulation.

The condition is characterized clinically by: a full pulse; strong heart-beat; dyspnea; dropsical conditions (ascites, etc.); cough from congestion and edema of the lungs; increased area of dulness in the cardiac region; diastolic bruit.

Insufficiencies of other valves are impossible to recognize during life in these animals.

Diagnosis.—The faulty heart action is not difficult to recognize, but to determine the location of the lesion is very difficult in small animals. In some cases, however, by carefully observing the symptoms and using the phonendoscope a differentiation is possible.

Prognosis.—Complete recovery cannot be expected even in mild cases of insufficiency, therefore the prognosis is unfavorable. However, the condition may exist for a long time in individual cases without producing any serious symptoms provided adequate compensation exists.

Treatment.—(a) During the stage of compensation no medical treatment is indicated. Keep the animal quiet as possible, avoid all undue excitement and exercise, and give nutritious food to maintain the general condition.

(b) Stage of broken compensation, when the symptoms of weakness, edema, palpitation, etc., appear, heart tonics are indicated. Digitalis fluidextract (0.05 to 0.15); tincture strophanthus (0.5 to 1.5 twice daily); or caffein citrate (0.1 to 0.2 twice daily). By the use of these preparations an effort is made to reestablish a compensatory action, and should this take place the symptoms of edema, ascites, palpitation, etc., will gradually disappear. Should this treatment be unsuccessful, a symptomatic treatment may be tried, such as the use of diuretics and cathartics to relieve the effusions, and in severe palpitation, sedatives (morphine). In cases of severe weakness, where the pulse is very weak and irregular, direct heart stimulants (camphor, ether, etc.) must be given to afford temporary relief. In disturbances of the digestive tract with loss of appetite, tincture of nux vomica (0.2 to 0.8) or tincture of gentian (1. to 2.) should be given twice daily to tone the digestive tract. Other symptoms that develop must be treated according to their importance.

MYOCARDITIS

The following forms of myocarditis are observed in small animals: (a) acute myocarditis, and (b) chronic myocarditis.

Acute Myocarditis.—**Definition.**—An acute inflammation of the heart muscle (myocardium). From a pathological standpoint two distinct types of this condition are recognized, viz.: the acute parenchymatous and the purulent myocarditis. From a clinical standpoint such a differentiation cannot usually be made. Therefore, both will be considered under acute myocarditis.

Etiology.—(a) From severe exertion, such as hunting dogs on long runs, continuous stud service, hard pulling of draft dogs, etc.

(b) Exposure to cold, or sudden chilling of the surface of the body, resulting in an unequal distribution of the blood, producing a congestion of the blood-vessels of the heart and occasionally resulting in an inflammatory reaction.

(c) Secondary to infectious diseases, such as distemper, pyemia, septicemia, tuberculosis. During the course of the infectious diseases toxins are formed and carried by the blood to the heart muscle leading to inflammation and fatty degeneration. The other organs in the body are often similarly affected during the course of infectious diseases.

(d) From poisons (arsenic, phosphorus, silver, mercury, etc.) being absorbed, carried through the circulation to the heart muscle, producing irritation, congestion, and some of them (phosphorus, arsenic) later fatty degeneration of the muscle.

(e) Often results by spread of the inflammation from the endocardium and pericardium, especially in ulcerous endocarditis and suppurative pericarditis, the infection reaching *via* blood the heart muscle.

(f) Direct injuries to the heart which occur quite frequently in small animals from foreign bodies perforating the esophagus or chest wall; also by being run over, the heart muscle becoming contused.

Necropsy.—Pathologically numerous conditions are found, the changes in the myocardium are quite varied, and in acute myocarditis may be classed under two heads as follows:

(a) *Acute Parenchymatous Myocarditis.*—This as a primary condition, is not very common, and is usually associated with acute inflammation in other organs. In this form there is found interstitial infiltration, inflammation of the muscle fibers, which are colored reddish-gray, yellowish-white, or even white. The muscle fibers are indistinct and show a more or less homogeneous structure.

Diagnosis.—This is difficult as the symptoms are quite similar to endocarditis, pericarditis, etc. A careful examination should always be made. When insufficiency of the heart action exists without frictional sounds or bruits, myocarditis may be suspected.

Prognosis.—The prognosis is unfavorable, especially in secondary myocarditis, due to infection, or during the course of infectious diseases. Even in primary acute myocarditis there are always degenerative changes in the heart muscle which are impossible to entirely overcome. If recovery occurs it is as a rule only partial (chronic myocarditis).

Treatment.—*Hygienic.*—The animal should be kept in a quiet place, avoiding all excitement or handling.

Medical.—The heart weakness should be treated by using heart stimulants and tonics, such as dilute alcohol (2. to 4.); fluidextract digitalis (0.075 to 0.1); caffein citrate (0.5 to 1. subcutaneously every six to ten hours); ether (2. to 4. subcutaneously); oil camphor (1. to 4. subcutaneously); or atropine sulfate (0.04 to 0.075 subcutaneously). The use of these preparations will depend largely upon the needs of the case.

In very acute cases there is no treatment that will produce satisfactory results.

Chronic Myocarditis.—**Definition.**—A chronic inflammation of the myocardium. This condition occurs frequently in small animals but is rarely recognized during life. It is often confused with other heart affections.

Etiology.—(a) Occurs commonly from mild, acute attacks, especially in those cases where the interstitial connective tissue is primarily involved.

(b) During the course of chronic muscular or articular rheumatism in old dogs; also from chronic nephritis, tuberculosis, pericarditis, endocarditis of dogs, and cats.

(c) Chronic poisoning by chemicals, toxins, etc., often will produce the condition by interfering with the circulation through the coronary arteries.

Necropsy.—Throughout the heart muscle appear circumscribed masses of fibrous tissue which are white in color and of firm to hard consistency. They occur most conspicuously near the apex of the left ventricle. The fibrous areas may be quite dense, like a cicatrix, constituting the so-called "heart-scar." Pigment and calcareous deposits may be present in them. The affected heart wall becomes very thin in places and may bulge forming a so-called aneurysm. Fatty degeneration may be present. The heart may show hypertrophy with dilatation.

develops often also after abscesses, wounds on the skin, abscesses in the internal organs, septic metritis, sapremia, etc. The organisms or their products (toxins) are carried by the blood to the endocardium where they become lodged, especially along the edge of the valves. They propagate, produce irritation, and assisted by the mechanical action of the valves, an active inflammatory reaction, is soon established. The inflammation spreads to the other parts of the endocardium and may cause a general endocarditis. The rapidity of the process depends upon the virulency of the infection or the amount of the toxins present.

2. Spread of the inflammation from adjacent structures or organs may produce the condition, such as from a myocarditis, pericarditis, pleuritis, or a pneumonia.

3. There are several predisposing conditions which should be considered:
(a) chilling the surface of the body, such as exposure to cold, or cold baths, carelessness in thoroughly drying the skin of animals after baths, etc., make them more susceptible to infection by reducing resistance.

(b) In old animals degenerative changes of the heart muscle, valves, etc., make them less resistant.

(c) Young puppies, and kittens, from hereditary influences, often favor the development of the condition.

(d) During convalescence from long-continued diseases there is a predisposition to endocarditis.

(e) Traumatic conditions over the region of the heart (kicks, blows, fractured ribs, etc.).

4. Mineral poisons (mercury, phosphorus, etc.) or some drugs administered in large doses, or for too long a period, produce direct irritation to the endocardium, or predispose to the condition.

In the etiology of endocarditis, infection must always be regarded as the principal factor. In addition many cases no doubt occur from infection with *Dirofilaria immitis*.

Necropsy.—Macroscopically two forms of acute endocarditis are recognized, viz.:

though the lesions may be extensive no marked symptoms were noted during life. The aortic or bicuspid valves are most often affected.

Symptoms.—The symptoms of acute endocarditis vary considerably depending to a great extent upon the cause, and the nature and extent of the inflammatory process.

The early symptoms are those of a greatly disturbed heart action, which is at first palpitating and irregular; later the beat is diffuse. The number of heart-beats sometimes exceeds that of the pulse (Fröhner). The heart-beat is often so tumultuous, especially in dogs, that the entire body is shaken and can be observed some distance from the animal.

The pulse is very rapid, intermittent, irregular, and in the later stages becomes imperceptible. The frequency in dogs will be 120 to 300 beats per minute, and in other animals even more rapid. The heart muscle is at first normal, but soon becomes abnormal, the sounds often blended to a single sound. Later, characteristic endocardial bruits are heard, a blowing, stenotic (systolic) noise occurring with the first heart sound, and at times a prolonged rustling and vibrating sound occurs at diastole.

The temperature in the early stages is always high (103° to 105° F.), but in the dog it becomes normal or subnormal. Cats have a high temperature, which remains high for a longer period than in the dog. The respirations are accelerated, the dyspnea similar to that of pneumonia, a disease with which it is sometimes confused in making a diagnosis.

In the later stages of the condition, circulatory disturbances are quite prominent. These are manifested by cyanosis, venous pulse, edema of the lungs, etc. In the septic form a hemorrhagic diathesis appears with hemorrhages from the membranes, bloody urine, etc. As general symptoms, depression, weakness, etc., come on rapidly, the animal often shows complete prostration.

Diagnosis.—Acute endocarditis is quite difficult to recognize as the symptoms are similar to other diseases of the heart. It may be confused with any acute febrile disease having a sudden onset (septicemia, inflammation of the brain, pneumonia, etc.). A careful examination of the heart is always necessary for a diagnosis. It is often very difficult, and in some cases quite impossible to distinguish between acute endocarditis and myocarditis, with which it is very closely associated. Between the two forms of endocarditis it is almost impossible to differentiate. In the ulcerous form the onset is more rapid than in the verrucose, and sometimes the primary seat of infection can be located.

Prognosis.—The prognosis is unfavorable, especially in the ulcerous form. Complete recovery is rare. The valves are usually left permanently impaired, resulting in valvular insufficiency.

The course of the disease varies. It is sometimes very acute, ending in death in a few hours or days (endocarditis ulcerosa). Or the condition may last for several days or weeks, eventually developing into the chronic form (endocarditis valvularis verrucosa).

Treatment.—The animals should be kept in an absolutely quiet place avoiding all excitement or movement.

In the early stages (in dogs especially) cold compresses should be applied over the region of the heart (ice-bag or cold water compress). These should be changed as often as necessary.

Regulate the action of the heart by the use of digitalis, or if the heart is very weak, it should be stimulated by the use of alcohol, caffein citrate or ether subcutaneously. To reduce the temperature acetanilid (dog 0.2 to 0.5; cat 0.05 to 0.1) should be given twice daily.

In endocarditis from rheumatic conditions, salicylic acid or sodium salicylate (dog 0.2 to 0.5; cat 0.05 to 0.1) should be administered twice daily.

When general weakness is well marked, stimulants must be administered according to the needs of the patient. Camphor, ether, or atropine are best for this purpose.

HYPERTROPHY AND DILATATION OF THE HEART

Definition.—Hypertrophy is an enlargement of the heart due to a thickening of its musculature; dilatation is an increase in the size of the heart from an enlargement of its cavities. From a clinical standpoint a distinction between them cannot be made as they nearly always coexist. Hypertrophy is an active enlargement of the heart, while dilatation is a passive one.

Etiology.—Generally speaking the causes of hypertrophy of the heart are those conditions which interfere with the circulation of the blood and thus increase the blood-pressure. The following are the most common:

(a) Increase physical exertion. This occurs in dogs used for hunting (fox hounds, greyhounds).

(b) Adhesions between the pericardium and heart interfering with the heart action.

(c) Obstruction to the free circulation through the arteries, such as aneurysm of the aorta, stenosis of the aorta, thrombi, athromatous and arteriosclerotic processes, etc.

(d) Defects in the valves of the heart (chronic endocarditis).

(e) Diseases of the lungs, such as chronic interstitial pneumonia (common in the dog), adhesions, exudations, abscesses, chronic bronchitis, which increase the blood-pressure through the right heart.

heart is hypertrophied it assumes a round or oval form and is increased in size. The walls are usually two or three times the normal thickness, the muscles firmer, tougher, darker red in color, and the interstitial connective tissue occasionally shows marked proliferation. Sometimes areas of fatty degeneration are noted on the surface.

(b) In dilatation of the heart the cavities are found much larger than normal, and the walls thinner and weaker. In the active form of dilatation the walls are stronger than in the passive where they are relaxed and distended. Dilatation appears oftener in the right heart than in the left. The structure of the muscles may be normal. Usually, however, the organ is anemic, friable, the musculature yellowish-brown in color, often very thin, and due to a complete atrophy of the muscle, in some areas the wall is almost transparent.

Symptoms.—In true hypertrophy of the heart, especially compensatory, the development is often so gradual that it may exist for a long period without producing marked symptoms. In severe cases, when accompanying other diseases, it is characterized by a strong, full pulse, very loud, clear heart sounds, and an increase in the area of cardiac dulness. Due to the coëxistence of dilatation the symptoms which characterize hypertrophy are rarely noted in practice. The most prominent symptom of hypertrophy with dilatation is the extension of cardiac dulness, which in dogs may reach as far back as the last rib, or even to the false ribs.

Dyspnea, palpitation, disturbances in the circulation, dizziness, etc., are resulting symptoms. A prominent sign is the throbbing of the heart, which often shakes the whole body and may be seen quite a distance from the animal. The heart sounds are usually irregular, the first sound loud, metallic and sometimes vibrating; the second sound very weak and often imperceptible. The slightest exertion will produce a very rapid heart action. The pulse is weak. A venous pulse is common in old dogs. Ultimately, due to insufficient heart action, general cyanosis, ascites, hydrothorax, etc., develop.

Good, nutritious food should be allowed at all times. General stimulants are to be used when necessary.

RUPTURE OF THE HEART

Etiology.—(a) Traumatic influences (kicks, fractured ribs, being run over, falling, etc.). (b) Diseases of the muscular walls of the heart (abscesses, fatty degeneration and infiltration, endocarditis and myocarditis, atheromatous degenerations of the aortic walls at their origin, etc.). (c) Shock from operations, and other conditions and diseases.

Symptoms.—In most cases the animal dies apoplectic. In cases where the rupture is very small, symptoms of internal hemorrhage are noticeable. Death in these cases, however, usually occurs in a few hours.

Treatment.—No treatment can be given in this condition.

PART III

DISEASES OF THE DIGESTIVE TRACT

CHAPTER I

DISEASES OF THE MOUTH

Examination.—The examination of the oral cavity requires good light (daylight) or in some cases artificial light (electric bulb with reflector) is necessary where a careful examination is to be made. In docile animals the mouth can be opened by pressing the lips against the teeth above and below causing the animal to open the jaws. For protracted examination it is necessary to hold the mouth open by the use of tapes placed just back of the canines, one tape above and one below, which are grasped by an assistant; or a mouth speculum may be used. In vicious animals an anesthetic should be employed (morphine, nembutal, for dogs; ether for cats). For examination of the posterior part of the cavity, the tongue should be depressed with a tongue depressor, or pulled well forward with the fingers or tongue retractor. In examining the mouth, the following should be observed:

(a) *Odor.*—An offensive odor is noted from retained or decomposed food; ulcerative or gangrenous stomatitis; gangrene of the lungs; fetid bronchitis; acute and chronic gastritis; caries of the teeth. The odor is often characteristic and readily distinguished. In some poisonings the odor of the drug is evident (carbolic acid, hydrocyanic acid, etc.).

(b) *Secretions.*—Secretion is diminished in all acute febrile conditions; in some poisonings (belladonna, atropine). Secretion is increased in parotitis; inflammatory conditions of the mouth; injuries; foreign bodies; poisons (calomel); eruption of teeth in puppies; following injections of pilocarpin. An abnormal quantity of saliva is noted in the mouth in dysphagia. The saliva which flows from the mouth is in clear strands or in the form of foam from masticatory movements.

(c) *The Mucous Membranes.*—An anemic or pale condition is found in chronic constitutional diseases; intestinal parasites; skin parasites; severe hemorrhage. A hyperemic or congested condition is noticed in all acute inflammatory conditions in acute infectious diseases with elevation of temperature; occurs during the course of gastritis. Cyanosis occurs from chronic heart diseases; interference with respiration or the local circulation. A blue line is seen around the gums in lead poisoning.

(d) *Foreign Bodies.*—A careful examination should be made for foreign bodies which often become imbedded in the mucous membrane or around the tongue or forced in between the teeth. In cats, fishbones, needles or pins are often found in the posterior part of the mouth.

(e) *Neoplasms.*—Papillomata are frequently seen on the margins of the lips or on the mucous membrane in various parts of the mouth. Retention cysts often occur under the tongue (submaxillary gland), inner surface of

the lips and cheeks (buccal glands). Other tumors are occasionally found. In all cases where the mouth is held open, whether from complete or partial paralysis or foreign bodies, dumb rabies should be suspected and the examination made with care.

STOMATITIS

Several varieties of stomatitis are met with in practice as follows: (a) catarrhal; (b) ulcerative; (c) gangrenous; (d) phlegmonous; (e) parasitic.

Catarrhal Stomatitis.—**Definition.**—An acute or chronic inflammatory condition of the mucous membrane of the mouth.

Etiology.—**Mechanical.**—Injuries from foreign bodies or sharp material in the food (bones, etc.); from irritation due to tartar around the teeth; dentition; weed hairs penetrating the membrane (seen in hunting dogs after running in fields).

Chemical.—Irritating medicinal agents administered in concentrated form; poisonous (carbolic acid, arsenic, mercury, etc.); decomposed food which has been retained in the mouth; internal administration of calomel or lead compounds in too large doses or for too long a time.

Thermic.—Hot food or drink.

Infectious.—It occurs in the suckling young of bitches affected with infectious mammitis; accompanies infectious diseases (septicemia, distemper in dogs and cats); usually present during the course of gastritis, some of the toxins when absorbed into the circulation are secreted with the saliva and thus cause irritation to the oral mucous membrane; produced by extension of inflammation from other parts (pharynx, larynx and salivary glands).

Chronic constitutional diseases (rachitis, anemia and leukemia) are predisposing factors.

Pathology.—There is at first a superficial redness and dryness of the mucous membrane followed by an increased secretion and swelling. This secretion collects around the teeth and on the tongue in the form of a dirty gray or brown coating. The lips often become fissured and ulcerated.

Medical.—The use of antiseptic mouth washes is indicated (boric acid 2 per cent, alum or tannic acid 1 per cent, vinegar and water 1 to 10); in the severe chronic form direct application of silver nitrate (1 to 2 per cent) may be found useful. Tincture of myrrh applied direct to the gums is very useful as a deodorant and antiseptic.

Surgical.—Remove foreign bodies and tartar from around the teeth, using a curette.

Ulcerative Stomatitis.—*Fetid Stomatitis. Stomatocace. Sore Mouth.*

Definition.—An acute inflammation of the mucous membrane of the mouth resulting in the formation of ulcers, which appear most commonly on the margins of the gums.

Etiology.—This disease is found in weak, anemic dogs and cats. It also frequently develops during the course of distemper, rachitis and other constitutional diseases. It is found commonly in old dogs and cats with diseases of the teeth (caries), especially when these animals are insufficiently nourished. The exact causes producing this necrosis of the tissues are not definitely known. The character of the disease process points to infection. In man a similar disease is contagious. The *Bacillus septicus* has been isolated from the diseased area in dogs, and the *Bacillus necrosis* and *Bacillus coli communis* in cats, but have not been proved to be the specific cause. Lack of cleanliness in the mouth, diseased teeth and accumulations around them favor the occurrence of the disease. The internal administration of mercury in large or long-continued doses, may produce a similar condition of the gums.

Pathology.—The gums at first are swollen and dark red in color, but soon become pale yellowish and necrotic. The epithelium is destroyed, deep ulcers form, suppuration ensues and the teeth may become loose and fall out.

Symptoms.—In the early stages it begins as a severe stomatitis, the gums bleed freely, are swollen and partly envelop the teeth, but as their margins ulcerate and recede the teeth become more and more exposed. The ulcerative process may spread to the contiguous parts, destroying much tissue. Salivation is profuse and the odor of the breath very fetid. Chewing and swallowing are difficult. The temperature is usually slightly increased. In severe cases the afferent lymph glands are enlarged and symptoms of septicemia may be noted.

and silver nitrate (2 per cent) applied to the ulcers. In the mercurial stomatitis, a subvariety of the ulcerative, the treatment consists in the removal of the cause and the use of antiseptic mouth washes, sodium perborate—2 per cent.

Surgical.—Examine the teeth carefully and remove all incrustation. Loose teeth should be extracted.

Gangrenous Stomatitis.—*Canker of the Mouth.*

Definition.—A disease of the mouth characterized by a rapidly progressing gangrene, starting on the gums or lips and producing extensive sloughing.

Etiology.—This disease is usually seen in young animals (puppies, kittens, etc.) which have been kept under very unsanitary conditions; or in older animals convalescent from infectious diseases. It is evidently an infectious disease, probably due to the *Bacillus necrophorus*. The lack of resistance, especially in young animals, favors the development of the organisms. Accumulations of filth in the kennels and injuries to the tissues are predisposing causes.

Pathology.—The gangrenous area has the appearance of a corroded surface under which the mucous membrane seems transformed into a dry, finely granular or firm mass. It is grayish-yellow in color and bordered by a zone of thickened tissue, slightly reddened and somewhat granulated. The necrotic tissue is very adherent and can be only partially peeled off. The condition may extend to the underlying tissues and even involve the bones.

Symptoms.—Slight salivation and a disinclination to take food are the first symptoms noticed. An examination of the mouth at this time may show an area of inflammation or possibly an erosion. The latter rapidly increases in size and depth, forming a sharply circumscribed, or at times diffuse area of necrosis, which continuing to spread, may involve any of the adjacent tissues. It often perforates the cheeks forming a fistulous opening, or it may penetrate the hard palate and produce a greenish-yellow nasal discharge. With the involvement of the nasal passages, the larynx or trachea, respiration is disturbed. When life is prolonged for a week or more, necrotic foci may be established in the lungs, giving rise to symptoms of bronchopneumonia. As the disease progresses, salivation becomes profuse, deglutition difficult and the swollen tongue often protrudes from the open mouth. A very offensive odor is exhaled. When the infection becomes general (septicemia), the temperature is elevated (104° to 106° F.) and the animal shows extreme weakness. Diarrhea is not uncommon and indicates an invasion of the gastro-intestinal tract.

Diagnosis.—This is made by the rapid spread of the disease in the tissues of the mouth, fetid odor and the general symptoms.

Prognosis.—Ordinarily this disease shows no tendency to a spontaneous recovery and, if untreated, death usually results. If taken early, however, it usually responds to treatment. Under such favorable conditions the prognosis is good, recovery occurring in twelve to fifteen days.

Treatment.—*Dietetic.*—As the animal refuses food on account of the pain when swallowing it should be forced to take some nourishment (warm milk can be given puppies and kittens; milk and soups to older animals).

Surgical.—In those cases where the lesions are accessible, the treatment

consists in removing all the necrotic tissue with a curette. This exposes the causative agent, an anaërobe, to the air which inhibits its growth and development.

Medical.—The skin around the head, eyes and mouth must be thoroughly cleaned with antiseptic washes (boric acid 2 per cent, potassium permanganate 1 to 250). The direct application of carbolic acid (5 per cent), or Lugol's solution to the exposed areas has proved quite beneficial. In obstinate cases silver nitrate (2 per cent) may be used.

Prevention.—Prevention of this disease consists in a thorough disinfection once daily for a few days, of the mouth and nose of those animals that have been exposed and are predisposed by the eruption of the first teeth or the shedding of the milk teeth; or through association with affected animals. All filth should be removed from the kennel and disinfectants freely used.

Plegmonous Stomatitis.—**Definition.**—An acute phlegmonous inflammation of the mucous membranes of the mouth, lips and tongue.

Etiology.—**Mechanical.**—Foods containing irritating materials. In hunting dogs sharp projections, such as thorns, spikes, nettles, hairs, etc., on grasses and weeds are causes.

Chemical.—Carbolic acid, alkalies, ammonia, croton oil, etc., when concentrated, produce an intense inflammation and swelling of the membranes.

Infectious.—It is produced secondarily during the course of diseased processes of neighboring organs (infectious pharyngitis); also secondary to infectious diseases (distemper) in dogs and cats.

Pathology.—The mucous membrane is reddened, edematous and covered with a thick tenacious mucus. The subcutaneous tissues are infiltrated with serum. Desquamation of the epithelium is often noticed from the intense irritation.

Symptoms.—The disease begins with swelling, redness and a very painful condition of the mucous membrane. The local temperature is accelerated. The lips and cheeks become swollen, the lower lip hangs down and strands of saliva hang from the corners of the mouth. Later the mucous membranes on the inner surface of the lips, cheeks and the back part of the mouth are bluish-red in color. The gums are swollen and dark red, the tongue becomes much thickened which interferes with deglutition and forces the mouth open. In severe cases following infectious diseases, the submaxillary and sublingual lymph glands are swollen and very painful to the touch. The general symptoms depend largely upon the primary condition.

Diagnosis.—Is made by the acute inflammatory condition of the mucous membranes with the swelling of the lips, cheeks and tongue. The anamnesis in some cases will materially assist in making the diagnosis.

Prognosis.—Usually favorable; in the secondary cases it depends on primary condition.

Treatment.—**Dietetic.**—All solid food should be withheld for a few days and small quantities of liquid foods given (milk, meat broth, etc.).

Medical.—The mouth should be thoroughly cleansed twice daily with antiseptic and astringent solutions (alum 1 to 250; tannic acid 1 to 250; potassium permanganate 1 to 250).

Mycotic Stomatitis.—*Thrush. Soor. Aphtha.*

Definition.—An inflammation of the mucous membrane of the mouth produced by the *Oïdium albicans*.

Etiology.—The *Oïdium albicans* (*Monilia candida*, *Saccharomyces albicans*) is the exciting cause of this disease which is found occasionally in healthy young animals. This fungus is widespread in Nature, occurring especially on decaying vegetable matter as a saprophyte. The mycelia are composed of cylindrical cells, 1 to 4 microns wide and 10 to 20 microns long. The filaments show branching and the outer ends are rounded off or club-shaped. The rounded ends often contain oval, highly refractive bodies, the gonidia or spores, which are also found free between the filaments. If the free spores come in contact with the oral mucosa, in which there are slight epithelial defects, they may develop and lead to the formation of thrush spots and pseudomembranes. In some cases the filaments and spores may penetrate deeper into the tissues, or by metastasis involve the internal organs. Damp, warm rooms poorly ventilated and filthy, favor the growth of this fungus.

Pathology.—The affection begins with diffuse redness of the mucosa and the formation of a glistening or shiny adhesive exudate of grayish appearance. Small white or yellowish dots next appear, which stand out prominently against the hyperemic background. These patches may be quite large and when removed the underlying mucosa is congested and eroded. The disease usually begins on the tongue or inner parts of the cheeks, from where it spreads to other parts of the mouth. In severe cases it may extend to the pharynx, esophagus, and intestines. The microscope reveals filaments, spores, epithelial cells and pus.

Symptoms.—The general symptoms are depression, emaciation and loss of strength. On direct examination of the mouth an acid odor will be detected and the characteristic lesions or spots will be seen on the mucosa. These may be in the form of white or yellowish spots, or they may coalesce forming a superficial felt-like membrane which can be readily scraped off. Similar membranes form in the esophagus interfering with the appetite and nutrition. This condition leads to cachexia and death, which is often preceded by convulsions.

Diagnosis.—The disease is readily distinguished from other forms of stomatitis by the absence of acute inflammation. The diagnosis is made positive by the findings of the filaments or spores of the fungus in the deposits on the membranes. The clinical appearance may be confused with the condition due to the aspergillus fungi.

Prognosis.—When the disease is localized on the mucous membrane of

Symptoms.—They are noticed as small, isolated or confluent growths, usually pedunculated, of a whitish color and often rough (cauliflower-like) on their surface. They are found most commonly at the juncture of the mucous membrane and the skin, and on the inner surface of the lips, but may be generally distributed over the oral mucosa. They rarely interfere with mastication, but when present in large numbers or masses they may cause some salivation and from the decomposed food collecting around them a very disagreeable odor is emitted.



FIG. 2.—Oral papillomas.

Symptoms.—The tumor is found growing at the edge of the gums in the form of a hard, reddish enlargement varying in size from a pea to a walnut. Its growth is slow, often requiring months to develop into sufficient size to be noticeable. The slow growth and firm consistency assist in distinguishing it from any of the malignant growths.

Treatment.—Complete extirpation and cauterization of the wound with silver nitrate or thermocautery are curative.

Osteoma.—These tumors are found growing from the periosteum of the maxillæ. They are composed of osseous material and frequently develop after injuries to the periosteum.



FIG. 3.—Fibroma of inferior maxilla.

Symptoms.—Osteomas appear as very hard enlargements firmly attached at their base. As a rule the skin or mucous membrane is not adherent over them. Their hardness and slow growth readily distinguish them from malignant tumors.

Treatment.—Expose the enlargement by an incision through the soft tissues and dissect down to the base, when it may be removed if not too diffuse, by the use of bone forceps or a small bone chisel. Curette the surface until smooth and suture the overlying tissues. After-treatment may be the same as an ordinary wound, using antiseptics to cleanse it daily.

Retention Cysts.—*Ranula.*—These are enlargements appearing in the buccal cavity from a stoppage of the ducts of glands which discharge their secretions into the mouth. Cohesion of openings occurs from inflammations of the mucous membrane, swelling, etc., partially or completely clos-

ing the duct. At the same time the glands continue to secrete their fluids which distend the ducts forming the enlargements. Closure or obstruction of the submaxillary duct produces an extensive enlargement under the tongue. The distention may be of sufficient size to force the tongue between the teeth, resulting often in some laceration. The most common retention cysts, however, are from the ducts of the submaxillary or sublingual glands. When the obstruction is complete the secretions, as they collect, burrow downward along the neck producing an enlargement which appears subcutaneously in the submaxillary region, or may extend to the superior part of the neck, appearing as a soft fluctuating enlargement. There is an absence of inflammatory symptoms and the skin is not adherent over it. Such a cyst develops slowly in contrast to a rapidly developing hematoma; the skin is adherent in the latter. The contents of the cysts can be obtained by the use of a large aspirating needle or trocar and examined. The fluid which flows out very slowly is a thick, viscid, honey-like material which makes the diagnosis positive.

Treatment.—*Surgical.*—Complete removal of the cyst is hardly possible by excision, as the glandular secretion continues, and when adhesion of the edges of the wound takes place, another cyst will develop. The most satisfactory treatment consists in aspirating all of the contents and the injection of Lugol's solution or tincture of iodine to destroy the cyst wall and the secreting gland. The injection should be sufficient to distend the cyst so that some of it will be forced to gravitate into the gland to destroy it. This should be done every second or third day. Care should be exercised in making the injections to avoid possible iodism. As soon as the gland is destroyed, the secretions will stop, the gland will atrophy and the enlargement disappear. This usually takes place in three to four weeks.

MALIGNANT NEOPLASMS OF THE MOUTH

Epitheliomata.—These tumors appear most commonly on the margin of the lips, involving the mucous membrane, subcutaneous tissue, muscles and skin. They occur most often in old animals.

Symptoms.—In the beginning they are observed as small flat growths, which later have a tendency to show ulceration on the surface. The surface has a roughened, granulating appearance often covered with a thin dried mass. It gradually develops in size until it invades the entire lip and occasionally the maxillæ. Secondary enlargement of the cervical and submaxillary lymph glands is of common occurrence. Epitheliomata are diagnosed clinically by their rapid, progressive growth, roughened irregular surface and invasion of the entire lip. In cases where a satisfactory diagnosis cannot be made clinically a small portion can be removed for microscopic examination.

Sarcomata.—This tumor most commonly affects the maxillæ, usually the superior maxilla, as it originates either in the periosteum, the medulla, or the endosteum of the bone. They are frequently quite large and often invade the nasal passages, the orbits and the sinuses. Metastatic processes are common in the adjacent lymph glands and occasionally a generalized sarcomatosis is produced.

Symptoms.—The growth first appears as a rather firm, oval, reddish colored enlargement in close proximity to the maxilla. Later the surface becomes irregular, lobulated and covered with thickened mucous membrane. The tumor usually has a broad base rather firmly attached, but may in some cases be pedunculated. The growth is quite rapid, beginning as one enlargement around which eventually numerous secondary ones develop; later by confluence the base becomes broad. The teeth are often hidden by the growth or in some cases elevated from their position.

Treatment.—The removal of the entire growth should be done as early as possible. Under general anesthesia, dissect out the tumor, using bone forceps, elisel or curette, being careful to get out all the affected tissue. When the alveoli are affected, extract the teeth and curette and cauterize the cavities to destroy, as far as possible, all the sarcomatous cells. When the lymph glands and the sinuses are involved treatment is practically impossible. Roentgen-ray may be tried as remedial treatment in many of these cases.

FOREIGN BODIES IN THE MOUTH

Foreign bodies in the mouth consist principally of such objects as are taken in the mouth with food or during play. Fragments of bone are most common. These either penetrate the soft tissues or are firmly lodged in between the teeth, or, if larger, may be between the rows of teeth. Splinters of wood and pieces of wire are usually found imbedded in the mucous membrane. Needles, pins and fish bones are also common, especially in cats. Hunting dogs when running through the fields often have pieces of twigs or weeds forced in the mucous membrane of the mouth. Porcupine quills are common in localities where these animals abound.

Symptoms.—When the foreign body causes much inconvenience, the animal makes persistent attempts to remove it by pawing at the mouth with the feet and shaking the head. Masticatory movements may be continuous or the mouth may be held open, with some salivation. Smaller objects as needles, pins, etc., may not produce prominent symptoms at first and the former may only be noticed by the presence of a thread attached. Food and drink are either entirely refused or feeble attempts made at eating. Thorough inspection of the mouth reveals the foreign body or the wound in the membrane where it entered.

CHAPTER II

DISEASES OF THE TEETH

Examination.—Examination of the teeth can be done by elevating the lips, which readily exposes them, or by the use of tapes or a mouth speculum to hold the mouth open (see Examination of the Mouth). Careful inspection should be made for malformations, fractures, incrustations of tartar and disease conditions.

MALFORMATIONS OF THE TEETH

These are not common in small animals, only occasionally being seen as distortions of the skull bones so affecting the jaws that the teeth do not meet in proper relationship. This may result in excessively long teeth. A few instances of defective dentition are recorded. They are important only when they interfere with mastication and subsequent nutrition. Breeding has been carried to such an extent with some breeds (English bulldog, collie, etc.) as to amount almost to a malformation of the maxillæ with unusual relationship of the teeth in some individuals. In rabbits the incisor teeth often are abnormally long, interfering with prehension of food.

Treatment.—*Surgical.*—Surgical intervention is possible only in rare cases to improve the appearance or condition. Prescribe a suitable diet when the animal is unable to masticate solid food (meat, etc., should be given in small pieces). Long teeth may be removed or the points clipped off, care being taken not to expose pulp cavity, or to unduly injure the enamel.

FRACTURES OF THE TEETH

Fractures of the teeth with exposure of the pulp cavity sometimes occur, especially in dogs, and are usually due to fighting, falls on hard surfaces, kicks (horses, etc.), being hit with hard objects; often occur during play in attempting to catch a ball or stone when thrown; also due to biting iron bars in their attempts to escape from cages.

Treatment.—Under certain conditions it is possible to repair the tooth. If this is impossible extraction is recommended.

Treatment.—Remove all deposits from the teeth with a curette or scaling instrument, being careful not to injure the gums. Extract all loose teeth. Tincture of myrrh applied to the gums is useful as an antiseptic, astringent and deodorant. Sodium perborate in 2 per cent solution may also be used to good advantage. As this condition usually persists, these cases should have attention every few weeks. The feeding of hard foods or gnawing on large bones at least tends to inhibit the deposit of tartar.

ALVEOLAR PERIOSTITIS

Pericementitis—Periodontitis

Definition.—This is an inflammation of the alveolar periosteum.

Etiology.—It begins in most cases from the irritation produced by a collection of tartar around the teeth. As the incrustation gradually increases, it causes separation of the gums from the teeth and this leads to suppuration of the periodontal membrane at the neck of the tooth, and, as the process continues, the entire membrane becomes involved.

Pathology.—The affected tooth is loosened, slightly raised from its alveolus, and, from disturbance to the vessels and nerves leading to loss of nutrition, it becomes discolored (dark or yellowish). Injury to a tooth with exposure of the periodontal membrane may also lead to a similar condition but in this case only one or a few teeth are affected while in the former several, or in severe cases the entire set is lost.

Symptoms.—The animal either refuses food or takes only a small amount and this very carefully. Saliva flows freely and the mouth emits a foul odor. The gums are dark red (livid), swollen and bleed easily. Ulcerative stomatitis often accompanies this condition.

Treatment.—Extract all loose teeth and remove incrustations from the others. Disinfect the mouth daily with antiseptic solutions (potassium permanganate 1 to 250), or by direct application of tincture of myrrh to the gums. Extraction may be accomplished by the use of dental forceps, a mouth speculum being necessary to open the mouth when molars are to be extracted but not necessary for the incisors. Grasp the tooth as far up the root as possible and for single fanged teeth, loosen with half turn twist each way, and molars with a pressure alternately inward and outward, care being taken to avoid breaking the roots. General anesthesia should be used. Pentothal sodium administered intravenously in doses of $\frac{1}{8}$ to $\frac{1}{2}$ grain per 1 pound weight gives very satisfactory results.

infected. As long as the opening through the enamel is free the pus will be discharged without further complication but if it becomes closed with food particles, etc., an abscess develops at the root and the pus burrows out into the adjacent parts, usually into the sinuses or may break down the sinus wall, resulting in a maxillary fistula. The disintegration of the dental tissue is brought about by chemical action from the lactic acid fermentation in the mouth.



FIG. 4.—Bilateral dental fistula.

Symptoms.—This condition will be noticed only by careful inspection until the disintegrating process reaches the pulp cavity when it gives rise to sharp pain, depression of the head toward the affected side and careful mastication. When a fistula results the pain is not pronounced. Empyema of the sinuses often causes a distortion of the affected side. Suspect all fistulæ opening in the maxillary region as having their origin in a carious tooth. Bilateral dental fistula is rather common.

Treatment.—Extract the diseased tooth. If a fistula is present, it is readily irrigated when the tooth is removed. Thorough irrigation through the entire tract should be done daily, unless the tract can be packed in such a way as to avoid all food gaining entrance.

times daily. When there is severe swelling, astringent solutions are also indicated (alum 1 per cent).

Surgical.—In very severe cases or where abscesses develop, make deep incisions in the substance of the tongue followed by the use of antiseptic solutions.

GANGRENE OF THE TONGUE

Gangrenous Glossitis

Definition.—This is a gangrenous condition of the tongue which may involve the entire free end or appear as small rapidly spreading ulcers.

Etiology.—*Mechanical.*—Obstruction to the circulation from foreign bodies is not uncommon. Rubber bands are occasionally slipped over the tongue by children; rings of cartilage from the trachea or aorta from cadavers upon which the dog has been feeding, have been found around the tongue.

Infectious.—Gangrene of the tongue may be caused by the *Bacillus necrophorus* and often is associated with gangrenous stomatitis.

Chemical.—The action of concentrated drugs may be so severe as to cause gangrene.

Pathology.—When the tongue is encircled by foreign bodies which shut off the blood supply that part of the tongue anterior to the foreign body becomes swollen and in a few hours very dark and gangrenous and will slough off in three or four days. In cases of infection, the process begins as a small ulcer which rapidly extends and may involve the entire organ. Chemicals usually cause only small areas of gangrene which do not show a tendency to spread.

Symptoms.—The animals refuse food and drink, and saliva flows freely. If the tongue is much swollen it may protrude from the mouth. The inconvenience causes the animal to appear depressed. General disturbance is not noticed in the early stages but later, from the absorption of the gangrenous toxins, an elevation of temperature and symptoms of sapremia are seen.

Diagnosis.—The presence of the foreign body around the tongue partly obscured by the swelling, or in infection the rapidly spreading ulcer.

Prognosis.—This depends on the degree of compression by the foreign body, and the length of time it has been on the tongue. Complete obstruction of the blood supply for a few hours (4 to 6) will often result in loss of the tongue. The infectious form is favorable if treated early.

Treatment.—Remove the cause if a foreign body. When due to infection or chemicals, remove the necrotic material with a curette and thoroughly cleanse with antiseptic solutions (see Gangrenous Stomatitis). After removing the foreign body from around the tongue a few hours should be allowed for the establishment of the circulation and if it does not occur in that time, the affected part should be amputated. This must be done under general anesthesia. Fix the jaws open with a mouth speculum and draw the tongue forward, using blunt forceps or a tape suture through the healthy tissue to hold it. A pair of dull, heavy scissors can be used to remove the diseased part. A small éraseur will also do. Control the excessive hemorrhage by twisting the artery with forceps or by ligation. An animal with part of the tongue removed will have difficulty in drinking and water should be supplied in a vessel of sufficient depth to allow the mouth to be submerged or from a faucet placed at the height of the head.

CHAPTER IV

DISEASES OF THE SALIVARY GLANDS

Examination.—1. The glands can be examined by palpation for: (a) enlargements (cysts, abscesses, tumors, etc.); (b) inflammations; (c) wounds; (d) fistulæ.

2. The character and the amount of the secretions. The normal secretion is a mixture of secretions from the parotid, submaxillary, sublingual and the mucous glands of the mouth. It is a thin, slightly viscid, opalescent fluid, having a feeble alkaline reaction and a specific gravity of 1005 to 1008.

An increase in the salivary secretion is noticed in the following conditions: the different forms of stomatitis; dentition; chorea by reason of the increased masticatory movements; gastric ulcers; nausea; helminthiasis; severe pain; direct nerve stimulation either central or peripheral; uremia; mercurial poisoning; drugs, such as pilocarpin, which produce direct stimulation to the secretory nerve.

The secretion of saliva is diminished in the following conditions: during the course of fevers (pneumonia, septic fever, etc.); after the use of atropine or belladonna; fright and excitement; severe diarrheas; cirrhosis of the liver when ascites is developing; atrophy of the salivary glands.

PAROTITIS

Mumps

Definition.—An acute or chronic inflammation of the parotid gland.

Etiology.—*Mechanical.*—Direct injuries to the gland by being run over by vehicles; struck with stones; kicks, etc.; pulling back when tied and the collar injuring the gland or by being caught in a door.

Chemical.—The internal administration of potassium iodide in too large doses or the absorption of iodine from local applications will often produce it. Lead when given in large doses will sometimes cause acute parotitis which may result in a chronic induration of the gland. Inflammations of the mucous membrane of the mouth from chemicals will reflexly and by absorption produce an inflammation of the glands. Obstruction of the ducts from chemical action or from other causes of stomatitis often leads to a chronic parotitis. From the retention of the secretions, the glands become enlarged and hard and may resemble tumor-formation.

Pathology.—The acute parotitis in the early stages begins with a swelling, congestion and scrous infiltration of the interlobular connective tissue. Later small abscesses develop which become confluent, forming one large abscess. In chronic parotitis there is a thickening of the connective tissue and atrophy of the glandular substance which produce a hard, fibrous condition (indurative parotitis).

Symptoms.—The acute infectious parotitis begins with a swelling in one or both glands, with a collateral edema in the surrounding tissues. The swelling usually develops rapidly, is very painful to the touch and changes the appearance of the head and neck. The head is held away from the affected side or if bilateral is extended. The temperature is elevated (103° to 105° F.), the animal shows depression, partial or complete loss of appetite, and mastication is slow and careful. The saliva is usually increased in quantity and runs from the corners of the mouth in strands. In a few days abscesses develop, producing a fluctuating enlargement which discharges reddish colored pus when opened. In parotitis produced by injuries, lesions are often found on the skin. In most cases only one gland is affected and general disturbance will not be noted. When resulting from pharyngitis and stomatitis, the symptoms are modified by the swelling of the mucous membrane and connective tissues. There is quite an extensive edema of the lips, tongue and of the tissue around the gland. Chronic parotitis is characterized by a firm enlargement of the gland, acute symptoms being absent. The parotid duct may be distended from a closure of the buccal opening.

Diagnosis.—Acute parotitis may be confused with enlargement of the lymph glands and therefore must be examined carefully. The position, shape and nature of the enlargement are to be considered in making the diagnosis.

Prognosis.—Usually favorable. When abscesses develop a fistula may result from the opening of some of the ducts. In chronic indurative parotitis, the prognosis is less favorable.

Treatment.—In the early stages when the glands are enlarged endeavor to hasten resolution, or abscess formation. Moist, hot packs or a stimulating liniment (soap or white) may be used with good results. Infra-red lamp may also be used for the same purpose and is a convenient means of employing heat. When abscesses develop, they should be opened early so as to secure good drainage. When the incision is made, it should be only through the skin, and the tissues then separated with a blunt instrument in order not to injure the gland any more than is absolutely necessary. Irrigate the cavity daily with antiseptic solutions (boric acid 2 per cent. etc.). In cases where the discharge is persistent and abundant, tincture of iodine or Lugol's solution injected into the gland gives good results (see Salivary Fistula).

SUBMAXILLARY AND SUBLINGUAL GLANDS

These glands owing to their position are not as often injured as the parotid, therefore, inflammation due to traumatism is rare. Occasionally infection develops in the glands by gaining entrance through the ducts and producing an acute inflammation.

Symptoms.—Enlargement of the glands, profuse salivation with the head held extended. Abscesses often form in the glands which open and discharge a reddish colored pus. The opening may be through the skin or into the mouth.

Treatment.—See Parotitis.

SALIVARY FISTULA

Definition.—A fistula which discharges secretions from the salivary glands.

Etiology.—*Mechanical.*—Injuries (cuts, bites, etc.) in which the parotid duct or any of the smaller ducts are opened so as to permit the escape of saliva may follow operations for the removal of a calculus from the parotid duct.



FIG. 5.—Salivary cyst.

only to reopen in another place. Such openings have been found in the lumbar region.

Symptoms.—A small opening will be noted partially covered with matted hair and from which is discharged a thin serous fluid (saliva) and occasionally a small amount of pus. When probed, it will be found to be only subcutaneous unless in the region of the gland when it will be deeper and lead to the gland or duct. A history of these fistulæ appearing from time to time may extend over several months. In fistula of the duct, the saliva flows freely and increases where food is offered or taken.

Diagnosis.—The chronicity and the character of the discharge are usually sufficient to make a diagnosis.

Prognosis.—Unfavorable.

Treatment.—When the fistula is distant from the gland, probe carefully until the origin is reached. Open the skin at this point and apply treatment direct to the opening in the duct or gland. Tincture of iodine applied direct to the opening leads to swelling which occludes the opening.

In obstinate cases the thermocautery should be used. When parotid duct is open, suturing may be attempted. When all treatment fails complete destruction of the gland by repeated injections of iodine directly into the gland or extirpation should be practised.

CHAPTER V

DISEASES OF THE TONSILS

Examination.—The tonsils can be readily examined in docile animals by opening the mouth (see Examination of the Mouth) and pulling the tongue well forward. In vicious animals, partial or complete anesthesia is advisable. The tonsils should be examined for acute or chronic inflammations, deposits of mucus on their surface, abscess formation, tumors and foreign bodies. The adjacent lymphatic tissues are frequently involved producing a diffuse enlargement of all the surrounding parts.

TONSILLITIS AND LYMPHADENITIS

Definition.—An acute or chronic inflammation of the tonsils and the adjacent lymphatic tissues.

Etiology.—Tonsillitis is of very frequent occurrence. Some breeds (Boston terrier) seem to be particularly susceptible.

Exposure to wet and cold and bad hygienic surroundings appear to have a direct influence in producing the disease.

Chemical.—Carbolic acid, arsenic, etc., may produce it by direct irritation.

Mechanical.—Foreign bodies (sharp pieces of bone, needles and pins, etc.) often penetrate the glands and lymph tissue resulting in acute inflammation. Inflammation of contiguous parts will often produce the condition by spread of the inflammatory process (stomatitis, pharyngitis, etc.).

Infectious.—The tonsils and lymphatic tissues undoubtedly harbor many microorganisms, the most common of which are the streptococci and the staphylococci. These organisms by their rapid development in the tonsils produce an acute inflammation, and from there, they or their products may enter the general circulation and produce symptoms of a general infection, or toxemia. Further, this condition may appear during the course of some diseases, as distemper, rabies, endocarditis, etc.

Pathology.—The tonsils and the lymphatic tissues become swollen, reddened, and later covered with a thick, tenacious mucus. Vesicles are frequently formed, and in some instances even membranous exudation, forming a pseudomembrane. The lacunæ of the tonsils become filled with a cheesy mass of exudation, often becoming confluent, forming small abscesses. The contents of the lacunæ are composed of epithelial debris and micrococci. In the chronic form, the tonsils become hypertrophied due to a multiplication of the glands mainly involving the lymphoid; or in some instances the fibrous stroma is increased and the tonsils become hard and swollen.

enlarged, forming abscesses. However, in the majority of cases the inflammation subsides within a week, the temperature becomes normal, and the local condition rapidly disappears. In the chronic form the symptoms are milder and are usually overlooked.

Prognosis.—In most cases favorable; depends somewhat upon the cause. The course is rarely longer than one week or ten days for the acute form, while the chronic form may continue for several weeks.

Treatment.—Locally the tonsils and the lymph tissues may be cleansed with a 5 per cent sodium bicarbonate solution. Astringent and styptic preparations (iron, alum, zinc and silver nitrate) may be found useful. Borax in glycerin (2 per cent) or thymol in glycerin (3 per cent) can be used as a deodorant when the mouth becomes offensive. Sulfa drugs may be used to good advantage. Abscesses should be incised freely to allow drainage and antiseptic solutions used. In chronic hypertrophy of the glands and lymph tissues, it often becomes necessary to remove them surgically. This can readily be done under anesthesia with the aid of a mouth speculum to fix the jaws open, when with a wire snare the glands can quickly be removed. After-treatment with antiseptic solutions (boric acid 2 per cent) may be continued for a few days.

CHAPTER VI

DISEASES OF THE PHARYNX

Examination.—The pharynx is easily exposed to view by opening the mouth and pulling the tongue forward. For a more careful examination the mouth speculum may be used to immobilize the jaws, while in vicious animals it is always best to use an anesthetic.

PHARYNGITIS

Pharyngitis is divided into (a) acute, and (b) chronic.

Acute Pharyngitis.—**Definition.**—An acute inflammation of the pharynx.

Etiology.—**Mechanical.**—Sharp foreign bodies (needles, pins, sharp pieces of bone, etc.) may penetrate the mucous membrane and produce an acute local inflammation.

Chemical.—Inhalation of gases (smoke, ammonia, etc.) will produce inflammation in the pharynx as well as in the larynx. Drugs administered in concentrated form.

Thermic.—Very hot liquids or foodstuffs when swallowed frequently produce in dogs a severe pharyngitis. Exposure to cold when the body is heated will produce a congestion in the pharyngeal mucous membrane and this may result in an acute pharyngitis.

Infectious.—Many of the above causes predispose to infection, the most common of which are produced by the streptococcus and the *Bacillus neerophorus*. A severe form of infectious pharyngitis is occasionally seen in week-old puppies and kittens, in some cases amounting almost to an enzootic, affecting the entire litter. Pharyngitis is secondary to infectious diseases as rabies, distemper, and infectious nasal catarrh. It is often produced by an extension of inflammation from the adjacent organs and tissues (nasal catarrh, bronchitis, stomatitis, etc.).

Pathology.—(a) Acute pharyngitis is characterized by redness and swelling of the mucous membrane which has a glazed appearance due to the collection of mucus on the surface. Later there is an abundant discharge of a thick mucus or a mucopurulent exudate. Occasionally it may be tinged with blood. In severe cases small erosions appear on the posterior part of the pharynx. The lymph follicles are enlarged and appear as small, round elevated, reddish nodules projecting through the membrane.

(b) The discharge contains bacteria, leukocytes, blood cells and desquamated and degenerated epithelium.

Symptoms.—One of the first symptoms is difficulty in swallowing food. Frequent attempts at swallowing with the head extended are often noticed in the early stages. Later, in the more severe cases, abundant salivation results from increased secretion and inability to swallow, while retching and sometimes vomiting will be seen in some cases from the irritation. The head is usually held extended and palpation of the pharynx produces pain. The submaxillary and retropharyngeal lymph glands often become enlarged and may produce abscesses. Occasionally in severe cases the salivary glands become involved. On examination of the pharynx the

mucous membrane will be found reddened, congested, and covered with mucus or mucopurulent exudate, depending upon the stage of the development of the disease, and in severe cases swelling and congestion of the adjacent tissues. Cough is absent and only occurs when the inflammatory process extends to the larynx. In all cases where infection develops, the temperature is elevated (103° to 105° F.). In mild cases when the general symptoms are absent, the appetite remains good although the animal takes food slowly and with care. In severe cases there is a complete loss of appetite.

Diagnosis.—The symptoms of acute pharyngitis are very characteristic: the extended head, difficult swallowing and salivation; while direct examination and the temperature readily distinguish it from foreign bodies, tumors and paralysis of the pharynx.

Prognosis.—In older animals it is favorable, recovery occurring in one to two weeks. In young animals, when it occurs as an enzoötic, the mortality is high.

Treatment.—*Dietetic.*—Soft liquid foods (rice soup, milk, extract of beef, etc.) should be given in preference to solids to avoid irritating the mucous membrane.

Medical.—Local treatment in the form of astringent and antiseptic solutions (2 per cent silver nitrate solution; 5 per cent alum solution; iodine and glycerin 1 to 30) applied directly to the membrane by using a pledget of cotton held in dressing forceps. In milder cases a solution of potassium chlorate (2 per cent) or iron sulfate in the drinking water is recommended. A Priessnitz compress applied over the pharynx and followed with mild stimulating liniments (soap liniment, etc.) is often beneficial. Internally mild purgatives, such as castor oil or cascara should be used.

Chronic Pharyngitis.—**Definition.**—A chronic inflammation of the mucous membrane of the pharynx.

Etiology.—This condition may follow repeated acute attacks, or is frequently associated with chronic nasal catarrh. It also occurs secondary to inflammation of adjacent tissues. Dogs constantly barking from a nervous temperament or during shows are often affected from the spread of the inflammation from the larynx.

Pathology.—The mucous membrane is relaxed, the lymph tissue becomes proliferated forming small, round elevations, red or bluish-red in color which project above the surface of the membrane, and is known as pharyngitis granulosa. The secretions are lessened producing a dry, glistening condition of the pharyngeal mucosa.

Symptoms.—The symptoms are similar in many respects to those of acute pharyngitis, but milder in most cases. The swelling of the adjacent tissues and lymph glands is hardly noticeable. The difficulty in swallowing is especially marked when a large quantity of food is taken or when the food is very hot or very cold. Direct examination of the pharynx reveals the bluish-red color and the elevations over its surface.

Prognosis.—Considered favorable in most cases, depending somewhat on the possibility of removing the causes. In the milder cases it is very often overlooked.

Treatment.—Direct application of Lugol's solution to the mucous membrane has been found useful in most cases. Tannic acid and glycerin

(1 to 30) may also be used. Chloride of iron (1 to 10) in water is of value owing to its astringent and antiseptic qualities. The application of the preparations should be made daily until the symptoms subside.

FOREIGN BODIES IN THE PHARYNX

Foreign bodies may find lodgment in the mouth or in the pharynx. When dogs are ravenously hungry large particles of food or food containing foreign bodies are swallowed which may lodge in the pharynx, producing choking. The condition often terminates fatally in a short time. Cats when fed on fish are liable to have fish bones lodge in the pharynx. These bones frequently penetrate the mucosa, producing an edema of the pharynx and larynx, resulting in death from asphyxia. Various kinds of foreign bodies have been found in the pharynx, the most common being needles, pins, bones, hard food masses, meat skewers, cartilage, etc.

Symptoms.—The symptoms vary somewhat according to the size and character of the foreign body. Dribbling of saliva from the corners of the mouth; frequent attempts at swallowing; clawing at the mouth with the forefeet, and sometimes retching and vomiting. When the foreign bodies are large they often interfere with respiration.

Diagnosis.—The diagnosis is made by direct examination of the pharynx (see Examination of the Pharynx), the sudden development and the characteristic symptoms.

Prognosis.—Depends upon the size and character of the foreign body. Where the foreign bodies are small and the animal can be treated at once, the prognosis is favorable. In other cases where edema occurs or where the foreign body is quite large, death may terminate before assistance can be given.

Treatment.—*Surgical.*—A mouth speculum is used to keep the mouth open and the foreign body often can be easily removed with long curved throat forceps. Holding the tongue well forward will materially assist in locating accurately the foreign body. When the foreign body is in the form of a threaded needle, which frequently occurs in cats, the sharp point is usually toward the mouth. Therefore care should be used in removing it to prevent laceration of the tissues. By grasping it with the forceps and pushing it downward until the sharp point is free from the tissues, it can then be readily removed. Large food masses often can be broken between the fingers and extracted or pushed down into the esophagus. Where edema of the tissues results from laceration and symptoms of suffocation develop, tracheotomy should be performed at once. (See Tracheotomy.) No after-treatment is necessary except when severe injury to the tissues has taken place; in these conditions the pharynx should be treated direct with antiseptic solutions (boric acid 2 per cent), using a dressing forceps with a pledget of cotton firmly attached.

PARALYSIS OF THE PHARYNX

NEOPLASMS OF THE PHARYNX

Polypoid Growths.—Polypoid growths (myxomas) are found occasionally projecting from the pharyngeal mucous membrane. They vary greatly in size from $\frac{1}{2}$ inch to 4 inches in length. From severe or sudden exertion or swallowing they are often forced into the esophageal opening, interfering with the passage of food and drink into the esophagus.

Symptoms.—Sudden interference with deglutition; symptoms of suffocation; often rapid recovery; periodic recurrence of the symptoms and direct examination of the pharynx will reveal the presence of the polypoid growths.

Treatment.—*Surgical.*—The mouth speculum should be used, the tongue pulled well forward and a small wire écraseur used to remove the enlargement. It should be removed as close to the base as possible. No after-treatment is necessary. Recovery takes place promptly.

Epithelioma.—These are found occasionally in old animals, and occur in the pharynx as a primary condition or may be due to metastasis. The retropharyngeal and submaxillary lymph glands are nearly always involved. This condition has been seen secondary to malignant goiter, having extended to the lymph glands by metastasis and from there to the pharynx.

Symptoms.—Difficulty in swallowing; fetid odor from the mouth; often profuse salivation. Direct examination shows the presence of an ulcerated enlargement on the pharyngeal mucosa. The general condition is in most cases disturbed. Emaciation, especially when due to metastasis; loss of appetite. A small portion of the enlargement should be obtained and examined microscopically to confirm the diagnosis.

Treatment.—No satisfactory treatment can be given.

CHAPTER VII

DISEASES OF THE ESOPHAGUS

Examination.—The cervical portion of the esophagus is readily examined by palpation over its course along the dorsal surface of the trachea. The probang affords a means of examining the interior for foreign bodies, strictures, etc., along its entire length. The roentgen-ray is very useful in locating certain kinds of foreign bodies.

ESOPHAGITIS

Definition.—An acute inflammation of the mucous membrane of the esophagus.

Etiology.—(a) *Mechanical.*—Irritation from foreign bodies (bones, needles, splinters of wood, etc.), passing of sounds, etc., lacerating the mucous membrane. External injuries to walls.

(b) *Thermic.*—Eating very hot foodstuffs or drinking hot liquids.

(c) *Chemical.*—Alkalies and acids, ammonia and corrosive medicinal agents frequently in their passage through the esophagus produce an acute inflammation.

(d) *Infectious.*—Occurs during the course of infectious diseases (rabies, distemper).

Secondarily it is produced by the spread of the inflammation from the pharynx or stomach. It occurs sometimes spontaneously in very young suckling animals.

Pathology.—Redness of the mucosa is rarely seen except after injuries or severe chemical irritants. The epithelium is thickened, desquamated and the surface covered with a fine granular substance. The mucous follicles are swollen and sometimes erosions may be seen. In phlegmonous inflammation, the mucous membrane is swollen, with a purulent infiltration in the submucosa. This condition is usually seen around foreign bodies when they penetrate the membranes, and, as a rule, remains localized. Gangrene of the membrane is sometimes seen where the injury or infection has been severe.

Symptoms.—In the milder forms of esophagitis the symptoms are unobserved. In more severe forms there is great difficulty in swallowing which act is often soon followed by vomiting. The vomitus contains blood, the solid particles covered or streaked with it. Frequent attempts at swallowing, constantly extending the head or moving it from side to side. In some cases where corrosives have been swallowed fragments of the mucous membrane will be ejected with the vomitus. There is profuse salivation, and blood is often mixed with the saliva. Palpation along the cervical portion of the esophagus produces severe pain. When localized in the cervical portion the esophagus should be palpated carefully for foreign bodies.

Course and Prognosis.—In the majority of cases, recovery takes place in one to two weeks. In very severe inflammation complications are liable to occur. Strictures or abscess with perforation of the walls of the esophagus.

gus may result. In the latter when the thoracic portion is involved the termination is fatal from infectious pleuritis.

Treatment.—In the early stages cold milk, or tannic acid (1 to 2 per cent) in cold water is indicated to allay the inflammation and to produce astringent action. Cold compresses to the cervical portion of the esophagus often have a beneficial action. Inflammations from caustic substances should be treated as early as possible with the proper antidote. When severe pain is shown small doses of morphine should be administered subcutaneously. Tincture of opium in dilute solution may be given *per orem*. In very severe cases where foods cannot be given *via* the mouth, enemata should be employed.

FOREIGN BODIES—OBSTRUCTION IN ESOPHAGUS

Etiology.—Obstruction in the esophagus occurs most frequently in dogs. The body lodges immediately posterior to the pharynx; at the lower extremity of the cervical portion at its entrance to the thorax; or near the cardiac orifice (at this point the lumen of the esophagus is less than at any other place along its course). Owing to the habit of these animals of taking food in large pieces and without mastication the majority of the obstructions occur just posterior to the pharynx. However, sharp bodies may be found anywhere along its course. In the dog a great variety of substances have been found producing the obstruction, as these animals during eating or at play swallow many substances that would not be found in other animals. The most common substances which are liable to produce the obstruction in dogs are: bones, cartilage, hard food masses, pieces of tendon, needles, rubber balls, meat skewers, stones, etc. In cats fish bones are frequently found which they get from eating scraps of fish given them without removing the bones. As a rule fish bones lodge in the anterior portion of the esophagus just behind the pharynx. Young kittens while playing occasionally attempt to swallow threaded needles, or pins which lodge at some point along the esophageal wall. Large bodies when indefinitely retained often produce a pressure necrosis with perforation of the walls.

Symptoms.—The early symptoms are those of refusing food, pain during swallowing, paroxysms of choking with retching and in some cases vomiting, salivation, and scratching at the mouth and neck. The head is held extended, the respirations become labored, and the patient evinces severe pain. In cats the mouth is held open, there is profuse salivation, and when the foreign body has penetrated the walls severe nervous symptoms are produced. The foreign body when located in the cervical portion of the esophagus will at once be recognized by the painful swelling which appears along its course, especially in the case of large objects. There is frequently edema of the surrounding tissues which may extend for some distance from the point of injury. Palpation usually reveals the size and character of the obstruction. Often when the objects are located just posterior to the pharynx by opening the mouth and pulling the tongue well forward they can be seen or felt with the finger. In cats, needles and fish bones are often seen by this method. In cases of small obstructions located in the thoracic portion of the esophagus, the symptoms are not so pronounced. Loss of appetite, emaciation and occasional vomiting are the most prominent manifestations of the condition. However, when sharp objects pene-

trate the walls at this point, various complications of a serious nature may be produced. The passage of a sound (horse catheter) is often a valuable aid in arriving at a correct diagnosis. Roentgen-rays may be used to assist in locating hard or metallic substances.

Diagnosis.—This is made positive by a careful examination together with the above mentioned symptoms. Care should be taken to exclude rabies as the symptoms are similar. (See Rabies.) Always beware of the dog with "bone in the throat."

Prognosis.—Foreign bodies located in the cervical portion of the esophagus can usually be removed. This is followed by rapid recovery except in those cases where necrosis is produced from pressure upon the walls, or extensive phlegmonous inflammation from perforation. It sometimes happens that needles and pins will penetrate the walls and become encapsulated in the adjacent tissues without producing any further disturbance to the animal. In other cases where they migrate to adjacent tissues they produce abscess formation. Foreign bodies located in the thoracic portion of the esophagus should always be considered unfavorable owing to their location and the danger of injury to the organs in the thoracic cavity or a purulent pleuritis resulting from perforation.

Treatment.—Obstructions to the esophagus are removed: (a) by use of throat forceps; (b) by propulsion with the sound into stomach; (c) by emesis; (d) by esophagotomy; (e) by gastrotomy and sound forcing the foreign body out *via* mouth.

(a) The throat forceps can often be used to an advantage when the object is located in the posterior part of the pharynx or in the anterior part of the esophagus. The mouth is held open with the speculum, the tongue pulled well forward, and the object grasped with the forceps and removed. Care should be taken to prevent laceration of the tissues in case of a sharp object or one of an irregular shape.

(b) The sound is to be used in those cases where the obstruction is located farther down the tube and cannot be reached with the throat forceps. Various kinds of instruments have been devised for this purpose. The horse catheter or horse stomach tube will answer in a large number of cases. It is introduced by using the mouth speculum, depressing the tongue. Having oiled the instrument, it is passed, holding it firmly against the roof of the mouth and following the posterior wall of the pharynx, into the esophagus. When the instrument reaches the pharynx the animal will invariably swallow, which greatly assists in its introduction into the esophagus. The sound is then brought in contact with the object which is carefully pushed into the stomach. When there is much resistance and the object is firmly fixed, the catheter should be removed and other methods used to dislodge it.

(c) *Gastro-forceps* are often useful in removing some kinds of foreign bodies from the esophagus. The forceps are passed into the esophagus and contact made with the foreign body by observation with the fluoroscope. The object is grasped and by gentle traction the instrument and foreign body are withdrawn. Care should be taken to injure the esophagus as little as possible.

(d) The act of vomiting, which is easily induced, will often displace the foreign body if it is not a sharp object in which case it may be dangerous. This is best brought about by the use of apomorphine (dogs 0.0016 to

0.006; cats 0.001 to 0.003). The administration of castor or linseed oil to lubricate the mucous membrane will often assist in removing the obstruction.

(e) Esophagotomy is performed in the following manner: secure the animal in the dorsal position with the head extended. Clip and shave the hair over the field of operation and cleanse thoroughly with antiseptic solutions (bichloride of mercury 1 to 2000; boric acid 2 per cent, etc.). Under general anesthesia, using morphine (0.016 to 0.21), ether, etc., make a skin incision over the obstructing body and between the muscles, being careful to avoid the large vessels of the neck. When the esophagus is exposed make a longitudinal incision through it of sufficient length to allow the foreign body to be removed. Care should be used to prevent laceration of the mucous membrane. When the incision is very long, one or more interrupted sutures may be made in the esophagus and the wound packed with gauze saturated in a boric acid solution (2 per cent), retained with sutures through the skin. Allow this to remain in position for twenty-four to forty-eight hours, then remove pack, the sutures in the esophageal wall and treat as an open wound, cleansing it daily with boric acid solution (2 per cent) until healing is complete. Withhold all food and drink for twenty-four to forty-eight hours or longer and then give only liquid foods for a few days. Rectal feeding of milk, eggs, etc., may be used when the swelling of the mucous membrane is sufficient to obstruct the esophagus.

(f) As a last resort when the firmly fixed object is located in the thoracic portion of the esophagus and cannot be removed by the methods mentioned, gastrotomy should be performed (see Diseases of Stomach), and the catheter introduced to propel the foreign body out *via* the mouth. Should the object be located in the cardiac portion of the esophagus, a small dressing forceps is often useful to grasp it and remove it *via* stomach incision.

ESOPHAGISMUS

Definition.—A spasmodic contraction of the esophagus.

Etiology.—This condition occurs occasionally during the course of some diseases. It has been observed in chorea, epilepsy and in the early stages of rabies. Sometimes foreign bodies, by irritating the membranes, produce a spasmodic contraction of the walls of the esophagus.

Symptoms.—Very similar to foreign bodies in the esophagus; often foreign bodies are also present.

Prognosis.—In most cases favorable.

Treatment.—The passage of the sound is usually sufficient to overcome the condition except in the case of foreign bodies being present. (See Foreign Bodies in the Esophagus.)

STRICTURE OF THE ESOPHAGUS

Definition.—A constriction of the esophagus due in most cases to cicatricial contraction of the walls reducing the size of the lumen.

Etiology.—The most common causes of this condition are the following: (a) cicatricial contraction of healed ulcers, usually due to corrosive poisons; injuries by foreign bodies, etc.; esophagotomy. (b) External pressure by enlarged lymph glands, enlarged thyroids, other tumors and occasionally pericardial effusion. (c) The growth of tumors in the walls of the esophagus

(metastatic sarcomas and carcinomas). The stricture may occur in any part of the esophagus, and in severe cases may involve the entire tube, but usually it is found either near the pharynx or the stomach.

Symptoms.—Difficulty in swallowing and only small quantities taken. Severe pain immediately after eating. Retching and vomiting are often noticed. Gradual emaciation due to the interference with deglutition. Examination of the esophagus in the cervical region by palpation or the passage of the sound to the thoracic region will usually reveal the constricted condition of the esophagus. The fluoroscope or roentgen-ray is valuable in making a positive diagnosis. Barium meal or bismuth should be administered previously.



FIG. 6.—Constriction of esophagus. Open to show point of constriction.

Prognosis.—Should be considered unfavorable in all cases of long standing. Recent cases, depending upon the cause, may recover sufficiently not to interfere much with the animal's general condition.

Treatment.—By surgical means the cause of the condition should be removed if possible. The passage of a well lubricated sound daily, for a time will in some cases overcome the constriction. In severe constrictions where a large portion of the walls is involved no treatment can be applied that will be of any service.

DILATATIONS AND DIVERTICULA OF THE ESOPHAGUS

Definition.—Dilatation is a diseased condition whereby the lumen of the esophagus is enlarged (ectasia œsophagi). A diverticulum is a saccular distention of the esophageal wall at a given point along its course (diverticulum œsophagi).

Etiology.—Dilatation may develop secondary to stenosis of the esophagus, from pressure of food masses retained above the stenosis resulting in paralysis or atony of the muscular wall; from foreign bodies remaining in the esophagus for sufficient length of time to produce paralysis; injuries; esophagotomy. Diverticula may result from overdistention of the esophagus with rupture of the muscles allowing the mucous membrane to prolapse; also due to cicatricial contractions following inflammatory adhesions to lymph glands.

Diagnosis.—The kind of tumor can only be determined by obtaining some of the enlargement for microscopic examination.

Prognosis.—When malignant tumors (carcinoma, sarcoma, epithelioma) are present, the prognosis is very unfavorable; retention cysts, unless they interfere with nutrition, are more favorable. Small ones may be present without being noticed for a long time.

Treatment.—No treatment should be attempted for malignant tumors. Retention cysts may be reduced by pressure from the outside or esophagotomy (see Esophagotomy) may be performed and the cyst wall destroyed.

PARASITES OF THE ESOPHAGUS

Spirocerca lupi.—This parasite occurs in the dog, wolf, jackal and fox. The worms inhabit tumors in the wall of the stomach and esophagus, and sometimes are found in lymphatic glands, bronchi, thoracic and abdominal cavities and in the wall of the aorta. They are blood-red in color. The male measures 30 to 54 mm. in length and the female 54 to 80 mm. The eggs are cylindrical and are passed out with the feces, and are then taken in by various species of coprophagous beetles. These beetles may be then eaten by dogs or may be taken in by birds, mice, rats and hedgehogs. Dogs can then become infected by eating these various animals.

Symptoms.—The symptoms are those of persistent vomiting and are not characteristic.

Diagnosis.—This is made by finding the worms on autopsy or the eggs by a fecal examination.

Treatment.—Unsatisfactory.

CHAPTER VIII

DISEASES OF THE STOMACH

Examination.—The stomach can be examined as follows: 1. By the character, condition and quantity of the contents, which may be obtained: (a) by the use of an emetic (apomorphine 0.0016 to 0.003, etc.), (b) by natural vomiting, (c) by the use of a stomach tube or (d) through gastrotomy (see Foreign Bodies in the Stomach).

2. Palpation over the region of the stomach will cause pain in acute inflammatory conditions, although this may be confused with painful conditions of the liver, peritonitis and enteritis.

3. By performing laparotomy and making a direct examination of the stomach. The mucous membrane may also be examined directly by performing gastrotomy.

4. Foreign bodies, displacement and dilation may be determined by the use of the roentgen-ray.

GASTRITIS

Gastritis is an inflammation of the stomach. The following forms are recognized: (a) acute, and (b) chronic.

Acute Gastritis.—*Simple Catarrh of the stomach. Acute Dyspepsia.*—**Definition.**—An acute catarrhal inflammation of the mucous membrane of the stomach which may involve the entire wall.

Etiology.—Acute catarrhal gastritis is usually due to errors in diet. The ingestion of more food than can be digested, irregular feeding, or eating unsuitable food, which is partially decomposed containing ptomaines (cadavers, garbage, etc.), and hard pieces of bone, ground glass, cartilage and tendon are very common causes of this condition. Injuries to the epigastrium (kicks, blows, and being run over by vehicles, etc.).

Chemical.—Various chemical substances (phenol, arsenic, mercury, phosphorus, etc.) when taken accidentally or given intentionally will produce a very serious form of gastritis (toxic).

Thermic.—Very hot, solid foods and liquids, or very cold, frozen foods will sometimes produce a gastritis. Rabbits eating frozen vegetables are thus often affected.

Infectious.—Infectious gastritis occurs during the course of most infectious diseases (distemper, rabies, etc.).

Parasites.—See Parasites of the Stomach.

Pathology.—Acute catarrhal gastritis is characterized by a swelling and hyperemia of the mucous membrane which is often corrugated, and intensely red with small ecchymoses appearing over the surface. Small superficial erosions are occasionally noticed.

Symptoms.—Vomiting occurs early and is the most prominent symptom often being quite frequent and in severe cases very persistent. The vomitus in the beginning consists of quantities of undigested and decomposed food material covered with mucus and sometimes streaked with blood, with a very disagreeable odor. When due to chemical causes it often has the characteristic odor of the poison. Later the vomitus consists almost entirely of small amounts of frothy mucus, and when the vomiting

is severe there is often an admixture of bile. The appetite in severe cases is completely lost and in mild cases it is variable and vitiated, the animal eating unnatural material. Bowel complications (see Enteritis) invariably follow severe cases of gastritis.

On examination the animals show pain on palpation over the region of the stomach, which manipulation often induces vomiting. There is a grayish-white deposit over the dorsal surface of the tongue (furred tongue); the temperature is elevated in the early stages of severe cases (103° to 105° F.), later the temperature is subnormal (97° to 100° F.). In milder cases the temperature shows but little variation.

The general symptoms in the early stages of severe gastritis are those of uneasiness and intense pain (howling, etc.); stiffness and considerable pain which is shown when the patient is moved about. In milder cases the only symptoms noticeable are occasional vomiting and variable appetite.

Diagnosis.—Acute non-infectious gastritis is not very difficult to diagnose as the symptoms are very characteristic and quite often the anamnesis is of value. The primary infectious form, however, may be confused with that due to specific infectious diseases (distemper, etc.), but this can be distinguished by the general symptoms, especially the temperature, which in the latter cases rises more abruptly and shows less variation than in the former.

Prognosis.—In primary acute gastritis, due to errors in feeding, the prognosis is usually favorable.

When due to poisons, foreign bodies, and injuries, it depends largely upon the extent of injury to the stomach and the possibility of removing the cause. In infectious gastritis, when not due to specific infection, the prognosis is usually favorable, but if accompanying a specific disease it depends on the primary disease.

Treatment.—*Dietetic.*—In strong animals all food should be withheld twenty-four to forty-eight hours and then only a small amount of easily digested food given at frequent intervals until recovery takes place. In weak individuals easily or predigested food may be allowed unless it induces persistent vomiting when nourishment should be given intravenously or *via* the rectum.

Medical.—Mild cases usually recover promptly following the use of a purgative (oleum ricini, dogs 15. to 60., cats 5. to 20.; milk of magnesia, dogs 4. to 30.; calomel, dogs 0.3 to 0.4, cats 0.01 to 0.005; cascara fluid-extract, dogs 5.0 to 10., cats 1. to 5.).

In severe cases unless vomiting has occurred an emetic, such as apomorphine hydrochlorate (dogs 0.005 to 0.01, cats 0.002 to 0.005) given subcutaneously is indicated to expel irritating material and foreign bodies which may be present. Following vomiting, irrigation of the stomach with a sodium bicarbonate solution (2 per cent) is advisable to remove irritating material from the surface of the mucous membrane. This can be accomplished by the use of a rubber tube or horse catheter inserted into the stomach. The warm sodium bicarbonate solution (500. to 1000.) may be introduced into the stomach by elevating the free end of the tube and using a funnel. Allow the tube to remain in the stomach for a few minutes, then depress it to allow the fluid to flow out again. Repeat this two or three times. To stimulate the functions of the stomach, stomachic tonics are indicated:

For Dogs

R—Ferri et quiniæ citratis	4 0
Pepsini	1 0
Sacchari albæ	2 0
Misce et fiat pulv. No. XX.	
Sig.—Give a powder every twelve hours.	

For Cats

One-half the above dose,

or

For Dogs

R—Tincturæ nucis vomicæ	7 0
Tincturæ gentianæ	10 0
Aqua communis	60 0
Misce et fiat solutio.	
Sig.—Give teaspoonful twice daily.	

For Cats

R—Tincturæ nucis vomicæ	1 0
Syrupi auranti	60 0
Misce et fiat solutio.	
Sig.—Give teaspoonful once daily.	

or

R—Acidi hydrochlorici	2 5
Tincturæ gentianæ comp.	10 0
Aqua	150 0
Misce et fiat solutio.	
Sig.—Give small teaspoonful three times a day.	

Vomiting is often present in these cases but it is usually stopped by the removal of the irritating material through irrigation of the stomach (lavage), but if it persists it may be controlled by using sedatives.

For Dogs

R—Bismuthi subnitratæ	0 5
Opil pulverati	0 2
Sacchari albæ	1 0
Misce et fiat pulv. No. VI.	
Sig.—Give one powder every four to six hours until vomiting is reduced.	

When due to chemicals the proper antidote should be administered (see Poisons).

Surgical.—When foreign bodies are present and cannot be expelled by emesis or purgation, gastrotomy must be performed (see Foreign Bodies of the Stomach).

gastric tumors, diseases of the liver, chronic constitutional diseases (anemia, chlorosis, chronic nephritis, etc.). *Parasites*, by constant irritation to the membranes for a long period, will produce chronic gastritis (see *Parasites*).

Pathology.—The stomach is usually enlarged, the mucous membrane pale, becomes gray in color and its surface covered with a thick, tenacious mucus. The veins are found distended and small hemorrhagic erosions and ecchymoses are seen distributed over the mucous membrane. In the later stages the mucous membrane becomes greatly thickened, especially toward the pylorus, and the mucous glands large and indurated from the constant irritation. Microscopically there is every evidence of a parenchymatous and an interstitial inflammation.

Symptoms.—This affection persists for an indefinite period and like most chronic conditions changes from time to time. In the dog, the animal most commonly affected, the appetite is variable, sometimes greatly impaired and at other times very good. Vomiting and retching are frequent symptoms and are especially noticeable a short time after eating. The vomited material consists of undigested food particles covered with a thick, tenacious mucus and has a very sour, disagreeable odor. After severe and prolonged paroxysms of vomiting, the mucus is frequently mixed with blood from the rupturing of small blood-vessels at the seat of the erosions. The chemical analysis of the vomited material shows the presence of abnormal acids, such as butyric or sometimes acetic in addition to lactic acid, while the hydrochloric acid is either absent or greatly reduced in quantity. Digestion, therefore, is delayed and decomposition and gas formation favored which in some cases greatly distends the stomach. Constipation is usually present, but in some cases there is diarrhea and the undigested food passes rapidly through the bowels. The urine is often reduced in quantity, has a high color and a very disagreeable odor. There are general symptoms of disturbed nutrition, resulting in emaciation and general weakness.

Diagnosis.—A diagnosis of chronic gastritis is not always easy as the symptoms present are also indicative of other conditions. However, by a careful analysis of the symptoms and considering the condition of the animal and a careful examination of the contents of the stomach, the diagnosis may be made with a certain degree of accuracy.

Prognosis.—A complete recovery in this condition is practically impossible. However, a great number of cases will improve with careful diet and treatment. As a rule an unfavorable prognosis should be made owing to the pathological changes which have taken place in the mucosa and muscular walls of the stomach.

depressed to allow some of the stomach contents to flow out. Should the contents be too thick to pass out through the tube, some of the 2 per cent soda solution (about 500 cc.) is introduced into the stomach by elevating the free end of the tube. Attach a funnel to the tube and gradually pour in the solution. After it has entered the stomach by gravity, allow it to remain for a few minutes, depress the tube and allow it to flow out again. This operation should be repeated until the liquid flows out freely and is clear of food particles and mucus. It is advisable in severe cases to repeat this treatment daily for three or four days and after this at biweekly intervals.

Bitter stomachics (tincture gentian compound 4.; or tincture of colombo 2.) are indicated before feeding to stimulate the mucous membrane and the muscular walls of the stomach. Small doses of pepsin and hydrochloric acid are indicated in severe cases to assist in digesting the food. These should be administered shortly after feeding to obtain the best results. Artificial Carlsbad salts (8.) given twice daily is valuable as a stomachic and anticatarrhal agent for the mucous membrane. Further, in cases where there is considerable fermentation, salicylic acid (0.2 to 0.5) or creosote (0.1) is useful to arrest the fermentation. These drugs should be repeated at each meal to obtain the desired results.

FOREIGN BODIES IN THE STOMACH

Etiology.—Dogs often swallow foreign bodies with the food, or during play, which pass into the stomach and produce symptoms of a serious nature. Most commonly the foreign bodies consist of small rubber balls, glass marbles, peach stones, stones, needles, pins, and meat skewers. During rabies (see Rabies), owing to the vitiated appetite, dogs eat large quantities of foreign material, such as splinters of wood, pieces of cloth, stones, straw, etc.

Cats often take with the food, needles, pins, fish bones, fruit stones, which enter the stomach and remain for some time, producing alarming symptoms.

These substances after entering the stomach may remain for a long time without producing any marked disturbance. However, as a rule they produce an acute or chronic gastritis and sharp objects may penetrate the walls of the stomach, producing an acute inflammatory condition, or peritonitis. Hair balls are occasionally found in the stomach of rabbits, cats, and dogs.

injury is produced in the membranes, the animals often show excitable symptoms, howling and other symptoms similar to rabies (see Rabies), stiffness in gait, and walk with the back arched. By palpation over the region of the stomach (especially in cats, rabbits and in some breeds of dogs), the foreign bodies can often be detected and their character determined. When perforation of the walls of the stomach is produced by sharp objects, symptoms of acute peritonitis develop (see Peritonitis). Lastly, under symptoms of general weakness, subnormal temperature, and very weak, imperceptible pulse the animals often die from exhaustion.

Diagnosis.—The characteristic symptoms, the anamnesis and careful palpation make the diagnosis rather easy when foreign bodies are present in the stomach. Direct palpation of the walls of the stomach (explorative laparotomy) is to be recommended in some cases where the diagnosis is in doubt. In other cases the roentgen-rays will assist in locating the foreign body.



FIG. 7.—Foreign bodies (small stones) in the stomach and intestines of a dog.

Prognosis.—The prognosis depends upon the character, size and condition of the foreign body, the general condition of the animal and the possibility of its removal. In many cases the prognosis should be made unfavorable.

Treatment.—*Medical.*—Emetics are often of value in removing foreign bodies from the stomach. Subcutaneous injection of apomorphine hydrochlorate (0.005 to 0.01) should be administered and the vomitus carefully inspected to determine whether or not the foreign body has been ejected. If there is a definite history of the animal swallowing a sponge rubber ball and it has been present a sufficient time to swell, apomorphine is contra-indicated. Should this method fail, surgical means should be employed as early as possible.

Surgical.—Small foreign bodies that are radiopaque may be removed by the use of gastro-forceps. This procedure is done in a dark room by the use of a fluoroscope. The animal is restrained in a lateral position and the forceps passed into the stomach, the operator following the passage of the instrument by means of the fluoroscope. As the end of the forceps approaches the foreign body the abdomen is manipulated in such a way as

to allow the foreign body to be grasped. The procedure is completed by slowly withdrawing the instrument and foreign body.

Laparotomy.—This operation should be performed at the median line whenever it is possible to do so. When the incision is made through the linea alba, healing may not be quite so rapid as if it were made just to one side through the muscular tissue. The former position is to be preferred, however, as there is little or no hemorrhage to interfere with the operation, and, as both sides of the wound are alike, the edges can be more evenly approximated by suturing.

The animal being secured in the dorsal position, and under general anesthesia, the skin at the field of operation is shaved of all hair and cleansed with ether and then painted with mercurochrome or tincture of iodine.

thumb and finger. Make the incision at the greater curvature and at right angles to the long axis of the stomach, and at a point where the blood-vessels are few and small. The organ is best opened by puncturing with a sharp-pointed bistoury through the muscular and mucous coats and then enlarging it with the scissors, the length of incision depending upon the size of the foreign body to be removed. The removal of large sharp-pointed bodies must be done with care and, if possible, they should be crushed to avoid making too long an incision. Blunt dressing forceps are useful to grasp small objects. The division of the muscular coat allows it to contract while the mucous coat projects on account of the excess of mucous membrane. Suture the mucous membrane with interrupted sutures $\frac{1}{8}$ inch apart, then suture the muscular coat in the same way, being careful to bring the edges in close contact. A Lembert suture is then applied over the wound to invert it. This is made by inserting the needle through a small portion of the muscular coat on one side of the wound, carrying it over and inserting the same way on the other side, and these when tied will invert the wound and bring the peritoneal surfaces in apposition, which favors an early adhesion and prevents the escape of the stomach contents. These sutures will be encapsulated and are not to be removed. Cleanse the surface of the stomach and return to the abdominal cavity. All food should be withheld for twenty-four hours, after which time a small amount of liquid food (milk, beef broth) may be fed for a few days, when the regular diet may be given.

ACUTE DILATATION OF THE STOMACH

Etiology.—This condition is observed more frequently in dogs and rabbits than in other small animals. It is most frequently produced by overloading the stomach, especially when large quantities of indigestible or dry foods are taken. Such substances as potatoes, bread (dry), dog biscuits, blood, some green foods, grains, etc., are the ones most liable to produce the condition. Dogs when very hungry, will often eat an entire bird, rat or mouse, without masticating it. When the mass reaches the stomach it will cause a sudden dilatation.

Debilitating Condition.—Both general and local, such as rachitis, anemia, toxic conditions, infections, diseases of the heart, etc. These conditions may be the result of various influences which alter the tone of the muscular wall, either indirectly by affecting nervous control, or more directly by toxic action on the muscle.

Previous gastric diseases often predispose to the condition, usually through fermentation, distending the walls leading to the gaseous form of acute dilatation. Excessive secretions at the same time will assist in the dilatation.

Injuries.—Such as blows on the abdomen, being run over by vehicles, spinal injuries, abdominal operations (ovariotomy) have been known to produce dilatation.

Pathology.—The stomach is usually of enormous size, extending back nearly to the pelvis. The color is bluish, purple-red, or pale, and the wall is often very thin. The dilatation not infrequently involves the duodenum and in some cases may extend to the other small intestines. At times the stomach will be found distended with hard, undigested food masses, and in rabbits rupture of the stomach at the greater curvature often takes place from the distention with food and gases.

Symptoms.—Vomiting is one of the early symptoms and the vomitus consists of many cases of particles of hard food masses, fluids, etc. Owing to the act of vomiting taking place early, some of the material will be ejected, so that in many cases this will be the principal symptom noticeable. However, in some cases where the stomach contents are not removed by vomiting, more serious symptoms develop. There is profuse ptyalism, accelerated pulse, dyspnea, evidences of severe pain such as howling, excitement, etc. In severe cases fermentation often takes place in the intestinal tract, producing severe dyspnea and death in a short time. In rabbits and some breeds of dogs, by palpation, the stomach will often be found greatly distended with food masses, gas; and fluids, which can readily be distinguished through the abdominal walls. Very often the symptoms of this condition are similar to acute gastritis (see Symptoms of Acute Gastritis).

Diagnosis.—A correct diagnosis requires a careful and accurate anamnesis. This condition is often mistaken for some acute abdominal disease, such as peritonitis, acute gastritis or intestinal obstruction. However, by carefully observing the symptoms, and by palpation, together with the anamnesis, the diagnosis is usually made without much difficulty.

Prognosis.—In those cases, due to overloading, the prognosis is considered favorable; when due to other causes it is unfavorable as complications are liable to ensue which often terminate fatally.

Treatment.—*Medical.*—When due to overloading the stomach or from foreign material, emetics are indicated early to remove it. Apomorphine (0.005 to 0.01) should be administered subcutaneously, and the stomach carefully kneaded to break up the food masses and to mix the contents with the secretions so that they will be more easily ejected. After the material has been removed by vomiting it is advisable to administer sodium bicarbonate solution (2 per cent) to remove irritating material from the surface of the mucous membrane. (See Treatment of Acute Gastritis.) In cases where there is a lack of tone in the muscular walls from pressure by retained food masses, gas, etc., or defective nervous control of the muscle, the administration of strychnine sulfate (0.0005 to 0.001 daily), or tincture of nux vomica (0.3 to 0.6 twice daily) has been found advantageous.

Surgical.—In severe cases where the food particles cannot be removed by emesis, or where foreign material is present, it is advisable to remove it by performing gastrotomy. (See Surgical Treatment of Foreign Bodies in the Stomach.)

CHRONIC DILATATION OF THE STOMACH

Etiology.—While not common in small animals it is occasionally observed, and consists of a dilatation of the stomach, which is very commonly produced by food masses remaining in the stomach for a long period, producing pressure on the walls of the stomach leading to a lack of tone in the muscular wall. This allows further accumulation of fluids and gases from the fermentation of the food contained and consequently the stomach becomes dilated. In some individual animals the walls of the stomach are relatively weak, and after eating, the food will remain in the stomach for too long a period, and gradually produce a chronic dilatation. Many of the causes enumerated under acute dilatation, if continued for some time, will result in the chronic condition.

Stenosis of the pylorus is one of the most frequent causes of this condition. The etiological factors producing the stenosis are the following: spasm, gastric ulcer, erosions of the mucous membranes resulting in cicatrix formation. Foreign bodies which remain in the stomach for a long period, and produce by their constant irritation hypertrophy of the mucosa of the pylorus, resulting in a narrowing or complete closing of the pyloric opening. Tumors, either malignant or benign, extending into the pylorus. Tumors, outside of the stomach (carcinomata, sarcomata) and associated with adjacent organs or tissues. These by producing pressure upon the duodenum will narrow the lumen and result in a stenosis. Inflammation in organs adjacent to the stomach as the liver and pancreas; or omental adhesions which occur commonly after abdominal operation, or by being injured, as blows to the abdomen or being run over by vehicles. The stenosis which is produced by the above causes will interfere with the passage of the food from the stomach, where it remains too long, eventually leading to chronic dilatation. In old dogs it frequently results from chronic obstipation. Further, debilitating diseases will often produce it by interfering with the nervous control of the stomach.

Pathology.—The stomach is much enlarged and in many cases distorted. When due to stenosis or obstruction to the pylorus, the stomach walls are greatly thickened. The musculature is hypertrophic and the mucous membrane is often several times its normal thickness, with all the evidence of a chronic inflammation. When no stenosis exists, the dilatation being produced by other causes, the muscular wall is very thin and atrophic. In some cases the mucous membrane shows areas of atrophy and hypertrophy alternating. The interstitial tissue is often infiltrated with fibrous tissue.

Symptoms.—In dogs the symptoms are very similar to chronic gastritis. There is a partial or complete loss of appetite, intense thirst, especially if the pylorus is obstructed, the patients drinking large amounts of water which is afterward vomited.

Constipation is also quite marked in most cases of chronic dilatation. As no matter can pass from the stomach to the intestines, the contents of the intestinal tract become hard and dry to be passed with difficulty, or retained as a hard mass in the posterior part of the bowels. When dilatation occurs without stenosis of the pylorus large amounts of water will pass into the intestinal tract producing diarrhea, which may alternate with constipation. Emaciation is usually quite marked, especially in advanced cases, because no nutrient can be absorbed. In some cases where there is only a partial stenosis the emaciation will be more gradual, as some food will be passed to the small intestines. Severe pain, the animal often showing excitable symptoms, howling, etc., is shown a short period after eating, due to the particles of food passing through the narrowed lumen of the pylorus. Where no stenosis exists there is but little pain. Vomiting is a constant symptom, especially in obstruction of the pylorus, and usually occurs shortly after feeding. The patient will sometimes eat the ejected mass again only to repeat the act of vomiting. This symptom is quite characteristic coming as it does shortly after eating and continuing in some cases in the same manner for days or even weeks.

Gradually the animals become weak, anemic, the temperature subnormal, and die from inanition.

Palpation over the region of the stomach will often reveal the enlarged organ with its contents; percussion gives a tympanitic sound.

Diagnosis.—Diagnosis is rather difficult in most cases. The chronic course, the characteristic symptoms, and the findings of an explorative laparotomy suffice to make the diagnosis.

Prognosis.—The prognosis should be carefully guarded until the causes and condition of the stomach are thoroughly understood. Complete recovery is possible in both forms of this disease, provided the wall of the stomach is not permanently damaged and the general condition of the animal capable of improvement. However, in stenosis of the pylorus, it should always be considered unfavorable when tumors are present.

Treatment.—*Dietetic.*—Small amounts of easily digested food are to be given at short intervals during the day rather than large quantities at long intervals. In some cases where vomiting is persistent, rectal feeding should be employed, giving albumen or predigested foods.

Medical.—In dilatation accompanied by lack of tone of the muscle stomachic tonics, such as tincture of nux vomica (0.3 to 0.6 twice daily) or strychnine sulfate (0.0005 to 0.001), may be used.

Massaging or kneading the abdominal wall over the stomach is a valuable adjunct to increase the muscular tone. When stenosis exists surgical interference is the only thing that will give relief; it should be resorted to as early as possible. (See Gastroduodenostomy.)

ULCERATION OF THE STOMACH

Ulcus Ventriculi

Definition.—This condition is a more or less progressive destruction through necrosis beginning in the mucosa and often extending to and through the deeper layers of the stomach wall. True ulcers appear only where the gastric juice flows. They are found in the dog at the extreme lower end of the esophagus, in the stomach wall itself, and in a portion of the duodenum above the opening of the bile duct. The ulcerations may be acute or chronic. Sometimes a tendency to cicatrization and healing is shown. At the point where the stomach tissue is destroyed an oval or round opening or depression with irregular margins appears. The more chronic the process the greater the irregularity in outline.

Etiology.—Simple ulceration of the stomach is due to a destruction of the gastric epithelium, caused chiefly by a disturbance in blood circulation in the stomach and hyperacidity of the gastric juice. It is often brought about by inflammation of the mucosa or hemorrhages, resulting from poisonous substances, caustics, drugs (when administered in too concentrated form); sharp foreign bodies; during the course of infectious diseases (distemper, etc.), or from an invasion by the *Bacillus necrophorus* (puppies and kittens), or other local infections. General infection (pyemia) may too be a causative factor. These infections produce an extensive inflammation of the mucosa, often leading to a disturbance in the circulation, interfering with nutrition, and ultimately leading to an ulcerative process. Wounds of the mucous membrane from external violence, partial rupture of the stomach wall; or parasitic invasion are causes. They are often contributory to the beginning of the ulcerative process. Embolism is also a cause, producing infarcts in the mucosa and submucous tissue. Hemorrhagic erosions and hemorrhages occurring and associated with chronic diseases of the heart, liver or kidneys are probable causes. Hyperacidity may produce gastric ulcer when from any cause the mucous membrane is injured,

the acid acting upon the ends of exposed vessels by contracting them, thus inducing local anemia and eventually necrosis.

Pathology.—The typical ulcer is round or oval, extending more or less deeply into the mucous membrane or the wall of the stomach. They have a characteristic funnel shape, and when acute form a rather regular outline, while in ulcers of long-standing the margins become very irregular. When chronic ulcers are present, the entire wall is usually thickened. Sometimes a coalescence of the ulcerations or erosions occurs. When ulceration becomes severe and the submucosa is involved, adhesions exist with adjacent organs.

Symptoms.—In quite a large percentage of cases of mild ulceration or erosions the symptoms are never observed during the life of the animal. In more advanced ulcerations the symptoms are often very similar to chronic gastritis (see Chronic Gastritis). Bloody vomiting is a characteristic symptom. The amount of blood ejected varies, depending upon the extent of the injury to the vessels done by the ulcerative process. This condition usually persists for a long time with exacerbations and remissions. When the ulcer perforates the wall of the stomach symptoms of acute peritonitis develop rapidly and a fatal termination soon follows.

General symptoms of emaciation, weakness, and disturbances of the intestinal tract are usually observed.

Diagnosis.—An accurate diagnosis is very difficult, and can only be made by a careful observation of the symptoms. When ulceration is suspected laparotomy can be performed (see Foreign Bodies of the Stomach) to determine the condition of the stomach. However, when the ulcerative process is slight or only erosions are present, even this examination may not suffice for diagnosis.

Prognosis.—The prognosis is always unfavorable, as only the advanced cases are recognized clinically.

Treatment.—*Dietetic.*—Only small quantities of easily digested food (beef broth, milk, small amounts of lean meat finely divided) should be allowed, as there is danger of the wall rupturing at the point of ulceration.

Medical.—Astringents and hemostatics are indicated (bismuth subnitrate 0.3 to 0.5; or silver nitrate 0.05 to 0.1 well diluted in distilled water). These preparations can be administered two or three times daily, depending upon the action desired. Where severe hemorrhage takes place, adrenalin chloride (1. to 2. of a 1 to 1000 solution) may be given several times daily until the hemorrhage stops. To neutralize the acid secretions in the stomach Carlsbad salts (2. to 4.) can be used twice daily. In cases where vomiting is persistent small doses of tincture of opium (0.2 to 0.5) are administered every two hours until vomiting ceases.

Surgical.—In some cases where medical treatment does not afford relief, laparotomy should be performed (see Foreign Bodies of the Stomach) and the ulcerated area extirpated (see Gastrotomy, under Foreign Bodies of the Stomach).

HEMATEMESIS

go unrecognized, the determination of which would be valuable for the diagnosis of some diseases.

Etiology.—In hematemesis there may be no anatomical lesions on the mucous membrane (diapedesis); or the lesions may be very small but numerous and the hemorrhages copious coming from a large surface of the mucosa. On the other hand the lesion in the mucosa may be quite marked (rhesis; ulcer, etc.). In the dog hematemesis is quite common and has the following causes.

Local causes: ulcerations on the mucosa; erosions on the mucosa; acute and chronic gastritis; tumors; trauma which may be direct (foreign bodies, injury from stomach sound) or indirect (straining during vomiting, stomach operations); chemicals (poisons, purgatives, emetics).

Indirect local causes are further: obstruction to the portal circulation; pressure on the portal vein; thoracic diseases disturbing circulation; organic heart lesions, etc.

Hematemesis may occur also from many general causes which produce at the same time hemorrhage from several of the mucous membranes. The following are the most common conditions: septicemia; autotoxic conditions, uremia, etc.; blood dyscrasias and diseases, hemophilia, scurvy, pernicious anemia, leukemia. The blood may have its origin outside the stomach and come from contiguous abscesses rupturing the stomach wall, or from ulcers and fistulæ which may open a suppurating tract into the stomach.

Hematemesis also occurs during the course of infectious diseases (dysentery, rabies).

Pathology.—The pathological findings depend upon the amount of the hemorrhage. When the hemorrhages prove fatal there is a general pallor of all the viscera; where the hemorrhages have been slow and continuous fatty degeneration of the heart, liver, kidneys, gland cells are observed. The original cause will in part determine the nature of the pathological changes. The mucous membrane of the gastro-intestinal tract is pale, and remains of the hemorrhage will be noticed along its course, which is of a dark color and more or less tarry. At the seat of the hemorrhage will be found eroded vessels, and sometimes imperfect clot formation. Other lesions found are those of ulceration, foreign bodies, depending upon the original cause of the hemorrhage.

Symptoms.—These depend very largely upon the amount of hemorrhage and rapidity with which it flows. When the amount of hemorrhage is small the symptoms may be entirely overlooked. The vomited blood may be only in small quantities often poorly mixed with the ejected food. The color of the blood depends upon the amount and length of time remaining in the stomach. When fresh, the color is bright and the cells are unchanged; when retained in the stomach some time before it is ejected, it is dark, the oxyhemoglobin being changed to hematin, and resembles coffee grounds. A microscopic examination of the ejected mass will at once reveal the presence of large numbers of red corpuscles unless the blood has been retained in the stomach long enough for the red corpuscles to become entirely disintegrated.

When severe hemorrhages take place in the stomach, some of the blood will pass into the intestinal tract to be passed out with the feces. The feces will be of a dark tarry consistency, with a disagreeable odor. If examined the blood pigment will be found in large quantities.

General symptoms of internal hemorrhage are noticed in the more severe cases. The mucous membranes suddenly become pale and colorless, the pulse very weak and often imperceptible, dyspnea and general weakness appear. If repeated hemorrhages do not result fatally the patient suffers from chronic anemia.

Diagnosis.—This depends upon the presence of the blood mixed with the vomitus. Care should be taken in making the diagnosis in the dog as they often eat large quantities of clotted blood, or lick blood from bleeding surfaces which may produce vomiting. When this is suspected the general symptoms should be carefully considered and a careful anamnesis obtained if possible. A roentgen-ray examination should be made to eliminate the possibility of foreign bodies.

A microscopic examination of the contents from the stomach and bowels will in most cases assist in arriving at an accurate diagnosis. It may be differentiated from hemorrhage of the lungs by the presence of food particles, and the absence of air mixed with the material, and from the fact that it usually has an acid reaction from contact with the gastric juice.

Prognosis.—This depends very largely upon the cause, and to a less extent upon the severity of the hemorrhage. When resulting from wounds in the mucosa when not too extensive it should be considered favorable. However, when due to ulceration of the mucosa, or resulting from general causes the prognosis is unfavorable.

Treatment.—The early indication in the treatment is to keep the animal in a quiet place free from all excitement or noise. The administration of cold water (ice-water) internally or cold applications to the epigastrium in the form of cold water or ice are beneficial. To control the hemorrhage when severe, adrenalin chloride solution (1.5 to 2. of 1 to 1000 solution), or ergotin (0.2 to 1.) subcutaneously should be given every two or three hours until the hemorrhage stops. Gelatin given *via* the mouth has been highly recommended for the same purpose. In less severe cases mild astringents (tannic acid, lead acetate, tannoforn, alum) are to be used. When general weakness is well-marked subcutaneous injections of strychnine sulfate (0.0005 to 0.001), or caffeine citrate (0.06 to 0.19) are to be used to stimulate the heart action, and as a general stimulant. Saline infusions given as rectal injections, intravenous injections, or intraperitoneally are indicated in severe hemorrhages to replace the loss of blood in the body. When hematemesis is due to other diseases, the cause should be determined and treatment applied accordingly.

All food should be withheld for at least two days, and then allowed only in small quantities. Milk or beef broth is useful in this regard.

PARASITES IN THE STOMACH

The adult *Ollulanus tricuspis* is about 1 mm. long and has three points at the caudal extremity. The adult worm lives in the gastric mucous membrane and when present in large numbers, seriously interferes with the function of the membranes. These worms are viviparous, the female depositing relatively large larvæ. The larvæ develop in the stomach of the cat up to the third larval stage. They are then transmitted to other cats in the vomitus. When ingested by another cat, these third-stage larvæ develop in the stomach, into the fourth-stage larvæ and finally into adults. The *Physaloptera* spp. range from 13 mm. to 48 mm. in length. They are usually firmly attached to the mucosa, on which they feed and may suck blood. The female deposits ova which are passed in the feces. The life cycle is unknown.

Rabbits are chiefly infested with the *Graphidium strigosum*, often found in large numbers, and give rise to a fatal anemia. This parasite is 8 to 20 mm. long, body blood-red, filiform and transversely striated.

Symptoms.—The parasites which are proper to the stomach of small animals do not as a rule produce any marked symptoms unless present in very large numbers. The *Spirocerca lupi* of the dog may give rise to a chronic gastritis with frequent vomiting, an irregular appetite and resulting emaciation. The tumor-like masses in which the parasites live may perforate the peritoneum and occasion a fatal peritonitis. Large numbers of the *Ollulanus tricuspis* in the cat's stomach cause a thickening and ecchymosed condition in the mucous membrane with severe gastric disturbance. As the larvæ of this parasite migrate into the adjacent tissues, they can produce extensive inflammatory processes and give rise to pleuritis, peritonitis, bronchitis, etc. The *Physaloptera* spp. may cause vomiting and result in emaciation. The animal usually refuses food and in time becomes anemic. *Graphidium strigosum* produces a severe anemia in rabbits by abstracting blood from the mucous membrane of the stomach, and by so doing produces a disturbance in the function of the stomach with inanition as a result. In warren rabbits where they are continually subjected to reinfection, this anemia often terminates fatally, at times being epizootic in its extent.

Diagnosis.—The presence of these parasites may be determined by finding the ova or larvæ in the feces or vomitus. The ova of *Spirocerca lupi* and *Physaloptera* spp. are embryonated when deposited by the female worm. The adult *Physaloptera* is frequently found in the vomitus of the cat.

Prognosis.—Unfavorable in all cases of severe infection. Mild cases in dog, cat and rabbit often recover spontaneously or with ordinary treatment.

Treatment.—No satisfactory treatment has been developed for the parasites whose natural habitat is the stomach of the dog and cat. When such parasites are diagnosed, all the affected individuals should be removed and a thorough cleaning given all the houses, runways, and grounds to which they have had access. (For ascarids and tænia see Parasites of the Intestines.)

NEOPLASMS IN THE STOMACH

Tumors in the stomach, especially primary growths, are very seldom found in small animals. Occasionally secondary carcinomata or sarcomata occur.

Symptoms.—The symptoms observed are very similar to chronic gastritis (see Chronic Gastritis). The growth of the tumor is often sufficient to increase the size of the abdomen and can usually be palpated through the abdominal walls. Other symptoms are persistent vomiting, icterus, and loss of appetite. When a tumor of the stomach is suspected, laparotomy should be performed and a direct examination made.

Prognosis.—Unfavorable.

Treatment.—No attempt should be made to operate malignant growths. Tumors involving the anterior part of the stomach are inoperable owing to the location and close attachment of the stomach. Fortunately, however, tumors of the stomach usually involve the pyloric end, and in such cases gastroduodenostomy should be performed removing the entire part involved. Gastroduodenostomy must be performed with considerable care to prevent infection from the stomach contents and hemorrhage from the large vessels, and also to so place the ligatures as to avoid cutting off blood supply from any part of the stomach not removed. The *modus operandi* is as follows: thoroughly anesthetize the animal and secure in the dorsal position. Cover the field of operation with sterile cloths and provide plenty of suture material and medium-sized, straight bowel needles. Perform laparotomy at the median line from the xiphoid cartilage to the umbilical scar. Grasp the stomach and draw it up through the opening. Ligate the right and left branches of the gastric arteries, the splenic and the gastro-hepatic arteries. The location of the ligatures, along the arteries depends on the location of the excision. In all cases the ligatures must be close to the excision to avoid having an area of the stomach left without blood supply. Place a gastrectomy forceps, the jaws protected with rubber tubing, across the stomach just back of the point of each excision, and two others across the part to be removed far enough from the others to allow cutting between them with shears. The forceps protect against hemorrhage and escape of contents while the latter prevent escape of material contained in the part to be removed. Remove by cutting between the clamp with scissors and suture both ends with continuous suture over and over the cut edges to control hemorrhage, and invert the ends by putting in Lembert sutures. Remove the forceps and take up a part of the anterior wall of the stomach and apply the forceps, having the part that projects through the forceps about 2 inches long by $\frac{1}{2}$ inch through. Do the same with the duodenum about 3 inches from the pylorus. Place the forceps close together and apply sutures through the muscular coat close to the lower jaw of each forceps, and do not cut off the suture. Then make an incision in the stomach close to the line of sutures and one in the duodenum to correspond with the one in the stomach. Then with a new suture join the distal edges of the wound with Connell's sutures, the forceps being loosened but left in place to support the stomach. These latter sutures invert the cut edges and the first suture can now be continued over the Connell suture as a Lembert suture. Return the organs and suture the laparotomy wound. After forty-eight hours feed liquid food for several days.

CHAPTER IX

DISEASES OF THE INTESTINES

Examination.—The intestines can be easily palpated through the abdominal wall in most small animals, when they are not too fat, and this greatly assists in making an accurate diagnosis, especially of foreign bodies, fecal accumulation (coprolith), etc. This is best done by placing the animal in the standing position using both hands, one on either side of the abdomen. The kidneys in dogs and cats should not be mistaken for other enlargements. When necessary to make a more careful examination, as for perforating wounds, volvulus, etc., explorative laparotomy should be employed. The intestines are best reached by making the incision at the median line in the middle of the distance from the xiphoid cartilage to the anterior border of the pelvis, and of sufficient size to permit of a thorough examination of the entire length of the intestine. The roentgen-rays can be employed to detect foreign bodies.

The feces should be carefully examined for the following: frequency, color, odor, quantity, consistency, presence of blood, parasites or their ova, mucus, foreign bodies, undigested food. The peristalsis is important and can be examined by placing the animal on its side, covering the abdomen with a towel or cloth and applying the ear. The phonendoscope is of great assistance for this purpose. Percussion is important in differentiating accumulations of fluid or gas in the abdomen or intestines.

ENTERITIS

Two forms of enteritis are recognized in small animals, *viz.*: (a) acute, and (b) chronic.

Acute Enteritis.—**Definition.**—This is a catarrhal inflammation of the mucous membrane of the small intestine, as well as the upper portion of the large bowel. In small animals it is impossible from a clinical standpoint to recognize the condition as affecting different parts of the bowels as: duodenitis, ileitis, jejunitis, etc. Enteritis very frequently accompanies acute gastritis, the causes producing acute gastritis often extending into the intestines.

Etiology.—The etiology is in many respects similar to that of acute gastritis: (a) foreign bodies which irritate, such as sharp pieces of bone, needles, pins, etc. These when swallowed pass through the stomach into the intestines, often producing extensive irritation to the mucosa, resulting in an acute inflammation. Enteritis may result also from operations, such as laparotomy when the bowels are roughly handled, rectal injections and manipulations, etc.

(b) Chemical substances (carbolic acid, arsenic, phosphorus, mercury, etc.) produce a very severe form of enteritis by their corrosive action on the mucous membrane. Chemical irritants contained in food when eaten by the animals will produce the same condition. Sometimes excessive quantities of foods, or digestive disturbances may occasion fermentation in the intestinal tract and the formation of irritants that directly excite an

inflammatory condition. Also foods (meat, fish) may contain preformed toxic bodies, such as ptomaines or other products of bacterial action, which may occasion violent inflammation of the bowels. Cats are frequently affected by eating fish partially decomposed. The injudicious treatment of animals for the removal of intestinal parasites is a frequent cause of enteritis.

(c) Exposure to cold, or sudden cooling of the surface of the body may produce an enteritis by interfering with the innervation and circulation in the intestinal walls; also taking large quantities of cold water, frozen or very cold foods will induce it.

(d) Bacteria probably rarely cause inflammation of the bowels directly, but their action upon the intestinal contents causing fermentative changes are causes of enteritis. Enteritis is a common complication in certain infectious diseases (distemper, etc.).

(e) Severe infection with animal parasites can produce acute enteritis by the irritant action of the parasites upon the mucosa producing congestion and in some cases by attaching themselves to the membrane or burrowing into it. The severity of the inflammation produced depends very largely upon the number and species of parasites present. This condition is observed most often in puppies and kittens. Acute enteritis also occurs secondarily to other diseases, such as septicemia, peritonitis, and coccidiosis of rabbits.

Pathology.—The mucous membrane of the bowel may be involved in its entire length with almost equal severity, but usually certain portions are more seriously affected than others. The mucosa is swollen and reddened, the surface usually covered with mucus, which may be tinged with blood, and sometimes the submucosa is edematous with hemorrhagic extravasations. The lymphatic follicles are enlarged and project out from the mucosa prominently as light patches against the inflamed surface of the mucosa. In severe cases pseudomembranous or diphtheritic inflammations of the mucous membrane of the intestines may be seen occurring usually secondary to infectious originating elsewhere or from the action of corrosive poisons, which are very common in dogs. In all of these cases the mucous membrane is covered with an extensive, dirty yellow or grayish deposit, appearing as a coating over the surface or as a firmly attached pseudomembrane. This pseudomembrane may be found in the entire length of the bowel. Areas of the necrosis and deep ulceration are often seen where the pseudomembrane has been dislodged. Hemorrhages are often found under and from the mucosa, the blood mixing with the intestinal contents forming a dark red mass. The feces are very thin, even in the large intestine, and have a disagreeable odor. The mesenteric lymph glands are swollen and edematous.

blood, sometimes passed in quite large quantities, and in the form of clots. When due to poisons, the odor of the poison is often noticed in the feces.

Colicky pains are noted and in severe cases intense abdominal pain is one of the most prominent symptoms. The abdominal muscles are tense, contracted, often giving the animal a "tucked up" appearance. In severe inflammation of the bowels the dog will often lie stretched out on its abdomen, showing intense pain by howling, crying, nervousness, etc. Sometimes the nervous symptoms will be prominent enough to simulate rabies.

Vomiting is a common symptom provided the stomach is involved. The vomitus usually consists of food particles, mucus, blood, bile, and in rare cases feces from the small intestines. There is loss of appetite, except in the very mild cases. Fever is more or less high in the early stages, while later in the dog it becomes subnormal. The temperature, as a rule, cannot be depended upon to determine the severity of the condition, as it may be increased in slight cases, and in severe, be normal or subnormal. The general symptoms are those of weakness, in proportion to the degree of inflammation, complete prostration or collapse. The surface of the body becomes cold, the mucous membranes cyanotic, and there is well-marked dyspnea and a weak, rapid pulse. In cats the diarrhea is a very prominent early symptom. The feces are liquid and often mixed with blood. Complete prostration takes place early under symptoms of dyspnea, general weakness, and a very rapid weak pulse.

Diagnosis.—The recognition of acute enteritis offers no great difficulties in most cases. The anamnesis, sudden onset, abdominal pain, and the severe diarrhea are all quite characteristic. Only when diarrhea is absent would the diagnosis be difficult. A careful examination should always be made to determine if possible the cause of the enteritis, whether it is a primary condition or secondary to some other disease. Examination of the feces should be made both macro- and microscopically to determine their condition, the presence of blood, foreign material, parasites and their ova.

Prognosis.—In ordinary cases of enteritis the prognosis is usually favorable. However, it depends very largely upon the cause, and all cases should be considered serious until the cause can be determined. When due to corrosive poisons, ptomaines, toxins, etc., the prognosis should be considered very unfavorable, depending upon the amount of the material ingested. In cats the prognosis should be guarded as these animals are very sensitive to intestinal disturbances.

Treatment.—*Hygienic.*—The animals should be placed in a warm, dry place which is well ventilated and free from all noise and excitement. Not too many small animals should be allowed in one room, and the floors should be thoroughly cleaned (daily) and disinfectants, such as carbolic acid (5 per cent), freely used. The drinking water should be kept fresh, and the food, when allowed, free from dirt, dust, and not contaminated with bowel discharges. Collections of feces on the hair should be removed daily with warm water or bicarbonate of soda solution (2 per cent). The mouth may be washed with clean water to remove all food particles which might remain to decompose and eventually be swallowed to perpetuate the intestinal disturbance.

Diætic.—In most cases of acute enteritis, all food is withheld for at least twenty-four to forty-eight hours. After this time, when improvement

begins to be noticeable, dogs may be given small amounts of lean meat finely divided, milk, beef tea, rice soup, etc., once or twice daily. Rabbits should be fed small quantities of roasted oats, corn or barley, or roasted bread. Small amounts of cooked rice, oatmeal, cornmeal or bread and milk may be given once daily. Green foods should be withheld at first and only allowed in small quantities several days after improvement is noted. They tend to increase the diarrhea by their laxative action.

Medical.—In mild cases of enteritis, due to errors in feeding or irritating foodstuffs, etc., small doses of laxatives are indicated to remove the irritating material from the bowels. Castor oil (dogs, 15. to 40.; cats, 3. to 15.; rabbits, 5. to 10.), or calomel (dogs, 0.3 to 0.4; cats, 0.1 to 0.15; rabbits, 0.2) can be administered. Magnesium sulfate (dogs, 10. to 15.; cats, 1. to 5.; rabbits, 1. to 3.) is frequently used for the same purpose owing to its increasing the fluids in the bowels and flushing them out more promptly and thoroughly. It is best administered in solution with warm water.

In more severe cases where the diarrhea is persistent after the use of laxatives, it is necessary to administer styptics, such as opium (dogs, 0.1 to 0.5; cats, 0.005 to 0.2; rabbits, 0.05 to 0.1). In cases where severe pain is present, especially in dogs, morphine sulfate is indicated. It may be given (for dogs, 0.02 to 0.15) as a subcutaneous injection dissolved in water (5.).

Astringents are sometimes of value in controlling the persistent diarrhea and tannic acid is often administered for that purpose in the following dosage: dogs (0.1 to 0.5), cats (0.05 to 0.2), rabbits (0.05 to 0.2).

Where fermentative processes continue in the bowels disinfectants may be administered: lysol (0.5 to 2.), creolin (0.5 to 2.), salol (0.2 to 0.8).

It is often advisable in dogs to wash out the intestinal tract with bicarbonate of soda solution (1 to 2 per cent) followed by alum, tannic acid or iron sulfate solutions (1 to 2 per cent). This can be done quite readily in the dog by the use of a flexible rubber tube inserted as far up into the bowels as possible. The free end is elevated and a funnel attached. The solution is poured into the funnel and allowed to gravitate slowly into the bowels. When there is no obstruction the fluid will flow into the stomach and be ejected through the mouth. In very severe cases, where general weakness is apparent, stimulants are advisable. Subcutaneous injections of caffeine citrate (0.1 to 0.5) may be used as a heart stimulant. Normal salt solution, at the body temperature (100° F.), is of great value in severe weakness from hemorrhage or narcosis. It may be introduced intravenously, subcutaneously, intraperitoneally or per rectum.

Chronic Enteritis.—*Definition.*—This is a chronic inflammation of the small intestine, involving the upper part of the large intestines, but often extending to all parts of the intestinal mucosa. Frequently there is extensive ulceration at different places along the intestinal tract. In some cases the stomach mucosa is involved from the same causes that produce the chronic enteritis.

times chronic enteritis associated with them. Parasites in the intestinal tract are common causes.

Pathology.—The intestines always present evidences of long-continued inflammation of the mucosa, the surface being covered with excessive secretions of mucus or muco-purulent material. There are extensive areas of thickening in the mucous membrane; erosions and atrophy also may be present. Ulcerations and cicatrices are often noted. Ulcerations may lead to perforation of the bowel wall, producing a localized area of adhesive peritonitis, or in some cases a generalized peritonitis. The mucous membrane is usually bluish-red and at various points will be noted light and dark points due to the pathological changes in the structure of the membrane. The intestinal contents are usually liquid, of a slate gray color and emit a very offensive odor. Sometimes when constipation is present the feces will be dry and hard in the large bowels, and of a grayish color.

Symptoms.—The most conspicuous symptom is a continuous or intermittent diarrhea. However, diarrhea may alternate with constipation. The general symptoms are dulness, gradual emaciation, rough hair coat and inanition, which is marked, owing to the lost or variable appetite and the interference with digestion and food assimilation. From time to time the bowels are distended with gases from the fermentative processes in the intestinal tract. This is especially marked when constipation is present and the peristalsis reduced. At other times large quantities of gases, feces mixed with mucus and often streaked with blood, are passed during the period of diarrhea.

In most cases there is little evidence of abdominal pain, except when ulceration of the bowel wall takes place and an adhesive or a general peritonitis is produced. Then all the evidences of inflammation of serous membranes are present. (See Peritonitis.)

Diagnosis.—The long-continued course, the intermittent diarrhea, the anamnesis and the general condition of the animal will be sufficient in most cases to make a comparatively accurate diagnosis. However, a careful and thorough examination should always be made to determine if possible the cause of the enteritis. This is valuable, especially for a proper prognosis and rational therapeutics. The feces should be carefully examined for parasites and their ova, as these form a frequent cause.

Further, as this condition is often secondary to other diseases, a differential diagnosis should always be attempted. Look for chronic constitutional diseases, diseases of the liver, heart and lungs and chronic infectious diseases.

Prognosis.—Chronic enteritis whether of primary or secondary origin should be considered unfavorable owing to the pathological changes which have taken place in the mucous membrane. Complete recovery can hardly be expected even in mild cases. In mature animals the prognosis is considered more favorable than in young animals. When it occurs secondary to other diseases the prognosis depends largely upon the primary disease.

Treatment.—A careful regulation of the diet (see Acute Enteritis) is of great importance and should be thoroughly impressed upon the attendant.

Medical.—The action of the bowels should be kept as regular as possible by the use of castor oil, magnesium sulfate, etc. (See Acute Enteritis.) When diarrhea becomes persistent astringents are indicated, as in acute enteritis.

Washing out the bowels (see Acute Enteritis) is especially valuable in chronic enteritis to remove irritating material, mucus, fecal matter, etc.

If parasites are present proper anthelmintics should be employed. (See Parasites in the Intestines.)

To encourage the appetite and to aid in digestion, bitter stomachics (gentian, nux vomica) are indicated. In the treatment an attempt should always be made to remove the cause; when secondary to other diseases treatment should be given to promote the removal of the fundamental disease.

INTESTINAL HEMORRHAGE (ENTERORRHAGIA)

Definition.--This is a condition where hemorrhage takes place from the intestinal mucosa. It may be due to a definite change in the structure of the mucosa or occur during the course of certain diseases attended by hemorrhagic diatheses.

Etiology.--The causes of intestinal hemorrhage are quite numerous: (a) mechanical agents, such as sharp foreign bodies which penetrate the intestinal mucosa and injure the blood-vessels, producing a more or less severe hemorrhage. Parasites, by their irritating action on the mucous membrane, or by burrowing into the mucosa, will produce the same result. Injuries, such as being run over by vehicles, kicks, blows, etc., over the region of the abdomen will often rupture some of the vessels in the intestinal mucosa, resulting in hemorrhage.

(b) During the course of poisoning by chemicals or caustic substances, severe hemorrhage often takes place due to the corrosive action on the mucous membrane. Drugs, when administered in large doses, may produce a congestion of the blood-vessels of the mucosa, resulting occasionally in overdistention and rupture.

(c) Hemorrhage takes place sometimes from an engorgement of the intestinal circulation from diseases of the heart and liver, hemorrhagic infarction of the bowel from embolism or thrombosis of the mesenteric vessels, intussusception or strangulation of the bowel, or hernia. In these cases the hemorrhage may result from an overdistention of the blood-vessels.

(d) During the course of some diseases severe hemorrhage in the intestinal tract occurs, as in anemias, severe infections (dysenter) and certain degenerations.

(e) Tumors (carcinomata) and ulcerations on the mucous membranes may lead to severe hemorrhage by destruction of some of the blood-vessel walls. Hemorrhoids, collections of feces, etc., may produce hemorrhage in the large bowels.

Symptoms.--Hemorrhage in the intestinal tract is often difficult to recog-

occur during ulceration, action of parasites, etc., may produce different grades of anemia, depending upon the extent of the hemorrhage.

Diagnosis.—This can only be made after a careful examination of the animal and the discharges from the bowels. When slight hemorrhages take place, a microscopic examination of the discharges may be necessary to determine the presence of blood.

Prognosis.—This depends upon the cause, and the extent of the hemorrhage. In most cases bowel hemorrhage should be considered serious, as it is often impossible to determine the cause or extent of the hemorrhage.

Treatment.—The cause should be determined if possible, as the treatment depends very largely upon this factor. Opium is often of great value to suppress peristalsis. The tincture may be used in the following dosage: for dogs (0.5 to 1.), cats (0.2 to 0.5), rabbits (0.2 to 0.5). Astringents, such as tannic acid, tannaform, etc., are also indicated. They should be administered in rather large doses, and repeated every hour or so. Adrenaline chloride is most useful in severe hemorrhage: the dose for dogs is 2. of a 1 to 1000 solution given every hour; other animals one-half the quantity. Ergot may also be used. Hemorrhage from the rectum or large bowels is best treated by injections of gelatin dissolved in hot water, astringents (alum 2 to 5 per cent), or cold water. The injections should be repeated as often as necessary to control the hemorrhage.

When there is great loss of blood, normal salt solution (500.) should be administered intraperitoneally or per rectum. Further treatment depends upon the symptoms that develop.

contents through the bowels. The most common causes of diarrhea therefore are: (a) drinking excessive quantities of milk or water or eating large quantities of fat meat, lard, or butter. The unabsorbed fat or its decomposition in the intestinal tract acts as an irritant and greatly increases intestinal activity.

(b) Foods will sometimes produce diarrhea by their irritating action on the mucous membrane. Such substances as table scraps containing fruit stones, parings, or fish, cheese, milk, etc., may undergo fermentative changes in the intestinal tract or from their decomposition contain preformed toxic substances which excite diarrhea. Excessive amounts of food may set up a diarrhea as a result of derangement of the gastric digestion and secondary bacterial fermentations.

(c) A large number of purgatives, when administered in large doses, will produce diarrhea by acting upon the muscle of the bowel and the nervous mechanism stimulating peristalsis and thus hastening the contents through the bowels before absorption can take place. Salines (magnesium sulfate) increase the amount of fluid in the bowels, and also stimulate peristalsis. Some foods in which bacterial decomposition has taken place will have an action similar to salines greatly increasing the amount of fluids in the bowels by exciting secretion from the glands in the mucosa.

(d) In some animals (cat) the nervous mechanism of the stomach will be greatly influenced by shock, fright, excitement, etc., and severe diarrhea may result.

(e) Diarrhea may result from diseases of other organs. In diseases of the stomach, when undigested food is passed into the intestines, the resulting irritation may induce severe diarrhea. In valvular insufficiencies or other heart lesions a congestion of the mucous membrane of the bowel results and an excessive secretion follows. Diseases of the kidney may also produce diarrhea by vicarious excretion of urea *via* intestinal tract. The urea decomposes producing free ammonia which irritates the mucosa causing a severe form of diarrhea.

(f) Various infections in the bowels (distemper, etc.) are associated with a more or less intense diarrhea. Infections with lesions at some distance from the bowels may have diarrhea as a consequence due to the elimination of toxic substances from the intestinal mucous membrane. An overproduction of bile during the course of some diseases of the liver can have the same effect.

(g) Organic diseases of the bowels (catarrhs, ulcerations) often lead to diarrhea from the irritation and resultant products of decomposition.

(h) The normal contents of the bowels contain numerous varieties of organisms, which under abnormal conditions may multiply sufficiently or increase in virulence as to become pathogenic, producing diarrhea.

(i) Various specific organisms (coccidia, etc.) produce diarrhea. They will be considered under the diseases caused by them.

has not been sufficiently neutralized in the small intestines, may produce inflammation in the lower bowel, due to its irritant action upon the mucous membrane. In cases where both the small and the large bowels are involved the discharges are more abundant and liquid. The feces will be very thin and of a yellowish or a dark brown color. When the large bowel is particularly affected, the animal shows frequent attempts at defecation, and only a small amount of feces and blood mixed with quantities of mucus will be passed.

In the more severe forms of diarrhea colicky pains are often observed and in some cases the pain becomes intense. There are frequent attempts at defecation, and tenesmus is not unusual. When severe diarrhea is present it frequently produces extreme prostration and in cats complete collapse. The extremities become cold, the mucous membranes at first pale, later cyanotic and every evidence of extreme weakness appears.

The temperature as a rule becomes subnormal; however, in the very early stages it is often elevated one or two degrees.

The severity of the symptoms and the course depend very largely upon the causative agents producing the diarrhea. In mild cases it lasts only a few hours; in the severe forms several days.

Diagnosis.—This is established mainly by determining the cause. The history of the case is of great service in this regard. A thorough examination of the animal and feces is necessary for a differential diagnosis to distinguish this condition from specific diseases of the bowels.

Prognosis.—The prognosis is favorable in most cases but depends largely upon the cause. Diarrhea is a symptom and not a disease. Until the cause is determined an accurate prognosis cannot be made.

Treatment.—*Dietetic.*—All food should be withheld for at least twenty-four to forty-eight hours, especially where but little weakness or prostration is apparent. Should weakness develop small amounts of milk, or milk and egg beaten together, should be given every four to six hours. Later when the symptoms of diarrhea begin to disappear a little lean meat may be allowed. Cats may have small quantities of rice and milk, or salmon. Avoid the use of laxative foods, or foods containing irritating material of any kind.

Medical.—The first indication in the treatment of diarrhea is the evacuation of the irritating material from the intestinal tract. In a large percentage of cases the spontaneous evacuations are sufficient to rid the bowels of this material. However, as a general rule, it is advisable to assist Nature by the administration of a laxative to ensure the prompt removal of all irritating ingesta. Castor oil (dogs, 15. to 40.; cats, 5. to 10.; rabbits, 1. to 4.) is valuable. After thorough evacuation of the bowels opiates are indicated to control the excessive peristalsis and secretions. Useful is tincture of opium (dogs, 0.5 to 1.; cats, 0.2 to 0.5; rabbits, 0.2 to 0.5). These doses can be repeated every few hours if necessary.

Small doses of lime water are of value to neutralize excessive acidity which is often a common condition in small animals. The use of acidophilus milk in certain cases seems to be very beneficial.

Where severe pain is present, which is rather common in the dog, small doses of morphine sulfate (0.05 to 0.10) may be given subcutaneously.

Where the diarrhea becomes persistent, it should be treated as in acute or chronic enteritis. To prevent dehydration normal saline solution should be administered subcutaneously or intravenously.

CONSTIPATION—OBSTIPATION—INTESTINAL OBSTRUCTION

Definition.—An infrequent or difficult evacuation or retention of feces which may become abnormally dry or hard.

Etiology.—The common causes of constipation in dogs are lack of exercise and feeding dry food. Dogs kept in the house or kennel often withhold the feces until they become hard and dry. Usually in old dogs the peristalsis becomes slowed and there is lack of tone in the muscular wall with some dilatation of the large bowel which causes constipation. The passage through the intestine may be blocked by fecal masses (coproliths), foreign bodies, calculi, parasites or hair balls, the latter being more common in cats as they lick off and swallow loose hair. The lumen of the intestine may be narrowed as a result of chronic inflammation, cicatricial contraction, stenosis, tumors within the wall, or hemorrhoids. Causative conditions external to the bowel are hernias, adhesions, tumors, abscessed anal glands. Other causes are chronic inflammation of the liver with sup-

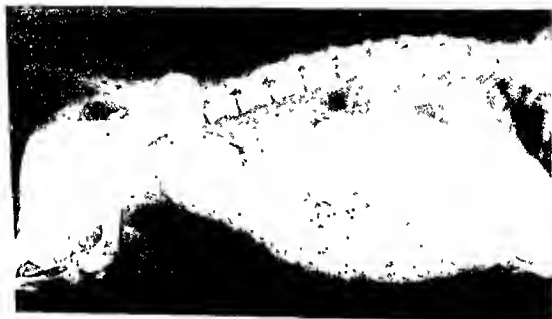


FIG. 8.—Obstipation.

pression of bile; chronic diseases of the spinal cord; enlarged prostates in old dogs; chronic inflammation of the anal glands; agglutination of the hair with feces at the anus in long-haired dogs. Rabbits are commonly affected by eating too much dry food. Hair balls or masses of hair and feces are often found in these animals.

Pathology.—The feces are dry, hard, usually of a light gray color and sometimes covered with mucus or streaked with blood. Coproliths or calculi or impactions of large size often result in necrosis of the intestinal wall with perforation and peritonitis.

Symptoms.—Mild cases show only difficult defecation at long intervals (two to four days). The feces are very dry, hard and may be streaked with blood from injuries produced in the rectal mucosa.

In severe cases the retained feces decompose producing toxins which are absorbed and intoxicate the patient. The odor given off from this condition is very characteristic and offensive. The animal will show depression, loss of appetite, increased temperature (103° to 104° F.), and thirst. Fre-

quent efforts at defecation are made, the attempts inducing cries of pain. There is a characteristic carriage of the tail which is arched as when defecating, and a fulness of the abdomen. Vomiting is not uncommon, especially in the more acute cases, the vomitus containing some bile and feces. Dogs and rabbits often show paralysis of the posterior parts.

Digital examination per rectum or over the abdomen will often reveal sensitiveness and the impacted fecal masses.

Diagnosis.—The frequent attempts to defecate, the condition of the evacuated material, and the presence of fecal masses on digital examination will readily identify the condition. Roentgen-ray is very valuable in determining the extent and size of the mass.

Prognosis.—Favorable in mild cases when due to errors in feeding; otherwise depends upon the size, extent and length of time the condition has been present and as well upon the primary cause of the condition.

Treatment.—Mild cases of constipation may be relieved by the use of a purgative given in full doses (castor oil D. 15. to 40., C. 5. to 10.; calomel 0.05 to 0.15), while in chronic cases after these purgatives clear the bowel small doses of laxatives (extract of cascara sagrada, 2. to 10.; tincture rhei, 5. to 10.) must be given for some time to prevent a recurrence of the condition. Tincture of nux vomica (0.3 to 0.6) or strychnine sulfate (0.001) is useful to stimulate peristalsis, especially when there is enervation from diseases of the cord, and to increase the tone of the muscular wall in dilations. In obstipation large quantities of warm soapy water, or oil and water, introduced with a soft rubber tube and irrigator well up into the rectum, will stimulate peristalsis, lubricate and soften the fecal masses and facilitate removal. Large doses, several ounces, of mineral oil given *via* mouth also facilitates softening and removal of the mass. A blunt irrigating curette can be used to break down the hard masses. Manipulation of the abdomen while irrigating is often beneficial.

the part of the intestine involved and apply a long bowel clamp lengthwise across a curved portion of the bowel, clamping off about 3 inches above the affected area, and another below, having not less than 8 inches between the two clamps. Bring the clamped-off portions in apposition, making a circular loop in the bowel, thus having the peristalsis in the same direction. Apply continuous sutures through the muscular and serous coat of the clamped-off portion just above the clamps, bringing the two parts in contact and leave the suture. Make an incision from 1 to 1½ inches long of same length and position in each bowel. Apply continuous suture over the free edges in contact. Loosen clamps but leave in position, and continuing with the latter suture, apply Connell's sutures closing the opening. Then beginning with the first suture apply Lambert sutures around to the point of beginning. Remove vessel ligatures, cleanse and return to the abdominal cavity.

Following these operations all food must be withheld twenty-four to forty-eight hours and then only small amounts of liquid food for several days. Tumor formations in the bowel are rare but when causing trouble must be removed by enterectomy (see Enterectomy).

VOLVULUS

Definition.—An intestinal obstruction due to a twisting or knotting of the bowel.

Etiology.—This condition is rare in dogs owing to the short mesentery. It may occur following falls or rough handling by children during play, or by a portion of the bowel passing through an opening in the mesentery caused by an injury or following operations (enterectomy).

Pathology.—Volvulus of the bowel is more or less obstructive owing to twisting or kinking which it produces. In other cases a loop of intestine is twisted about another like a bow knot or slipped through an opening in the mesentery which partly obstructs the passage of the contents. Gas formation soon dilates the bowel further obstructing it and also the blood-vessels. When the obstruction is complete the bowel above is much distended while the part actually involved, having the circulation arrested, will appear dark red and later become necrotic leading to peritonitis.

Symptoms.—As the condition is acute the symptoms appear suddenly and are very pronounced. They are abdominal pain, accompanied by vomiting, great prostration and a hard, rapid pulse. Palpation of the abdomen may or may not produce much pain; sometimes no change in the intestine can be detected.

Diagnosis.—The acute abdominal pain, the sudden onset, rapidly increasing severity of the symptoms, vomiting and rapid pulse, serve to identify volvulus and differentiate it from other more chronic forms of intestinal obstruction.

Prognosis.—Unfavorable unless recognized early when a prompt operation affords relief.

Treatment.—Injections of large quantities of warm water or of air into the rectum may be beneficial in some cases. However, owing to the rapid changes taking place in the bowel, laparotomy should be performed early, and an attempt made to reduce the volvulus. Should the involved part of the intestine be necrotic, enterectomy must be employed to remove the entire part affected.

INTUSSUSCEPTION

Definition.—The invagination of a part of the intestine into an adjacent portion.

Etiology.—The exact causes are not known, although from the conditions under which it occurs and by experiments it is believed to be due to irregular innervation by which a given spot is contracted while immediately below it there is a dilatation, thus permitting the latter to invaginate the former. It may be produced by supercatharsis, increased production of bile (icterus), or the taking of cold water immediately following severe exercise, all of which excite innervation or produce sudden increase in peristalsis. Predisposing causes are constipation; dilatations following removal of fecal masses by enterotomy; end-to-end enterectomy, the circular cicatrix being incapable of contraction or dilatation which favors invagination; tumors in the intestinal wall. Intussusception may involve any part of the small intestine. The small intestine may pass in the ilcocecal valve. Invagination of the colon or rectum may also occur.

Pathology.—Intussusception is a condition in which one part of the bowel slips into another forming a sausage-like enlargement of varied length. The enlargement is slightly curved from tension of the mesentery. As a result of the constriction, blood circulation is interfered with and often entirely arrested. In the early stages there is slight reddening, later the parts are swollen, congested and of bluish color. Adhesions occur between the adjacent layers in a few hours and finally the parts become necrotic and may perforate, leading to peritonitis. The rapidity with which these changes occur depends upon the extent of the intussusception as the further the invagination the greater the pressure on the blood-vessels; if the circulation be completely obstructed, necrosis will occur in a few hours.

Symptoms.—Intussusception manifests itself early by abdominal pain, the tension on the mesentery producing the first symptoms. It has been noticed in a few cases that the animal will lie on its back in order to ease the pain from mesenteric tension. Later symptoms of acute enteritis become prominent, the feces frequently show the presence of blood, there is tenesmus, colicky pains and occasionally vomiting, and the vomitus may be mixed with feces. Palpation of the abdomen may reveal an elongated enlargement of the bowel and slight pressure will cause pain. Palpation is difficult in very fat animals or those having a very thick-walled abdomen.

Diagnosis.—The presence of the painful enlargement of the bowel, bloody stools, tenesmus and the sudden occurrence are the principal diagnostic features.

Prognosis.—Unfavorable in all cases not operated early. If recognized early and reduced or the portion excised (enterectomy) a good recovery may be expected. Spontaneous healing may occur by sloughing of the invaginated portion and adhesion at the anterior part.

Treatment.—Intussusception of the posterior part of the bowel may be reduced in the early stages by dilating the bowel with rectal injections of large quantities of warm water, using as much pressure as can be applied safely. Air may also be used in the same manner. Purgatives or specific stimulants to peristalsis should not be used as they only serve to increase the invagination. Operative measures should be at once resorted to when other efforts fail. A laparotomy should be performed at the median line

just posterior to the umbilical sear, the enlarged portion of the bowel sought and attempts made to reduce it by careful manipulation. A small blunt probe or scalpel handle may be inserted between the adhered peritoneal surfaces to break down the adhesions which hold the two layers together. If this is impossible enterectomy must be performed. Place ligatures of heavy suture material around the bowel a short distance above and below the affected area and cut off the bowel with scissors making the incision diagonally across the intestine. Cut off the mesentery supporting the part to be removed, ligating each vessel as it is reached. Bring the parts of the bowel in end-to-end contact and suture with Connell's suture or if preferred a lateral anastomosis may be used. Aseptic end-to-end suture of the intestine may be used as described by John E. Searff, M.D., *Annals of Surgery*, 1926, 83, 490. After-treatment is the same as for enterotomy.

WOUNDS OF THE INTESTINES

Definition.—Wounds of the intestines frequently occur in small animals, especially the dog, which is more subject to injury than the cat or rabbit.

Etiology.—The most common causes are: falling from a great height, being run over by vehicles, kicks, or severe blows over the abdomen. Punctured wounds of the abdomen often penetrate the intestines, such as gunshot wounds or those produced by sharp objects (forks, etc.) which penetrate the abdominal walls. Penetrating wounds should always be considered serious, as the extent of the injury in the abdominal cavity is difficult to determine. There is also danger of infection being carried into the abdominal cavity from without, or from within, the bowel contents escaping into the cavity and causing septic peritonitis.

Symptoms.—Injuries to the intestines are usually accompanied by the following symptoms:

incision should be made in the median line to allow a complete and thorough examination of the entire intestinal tract and other organs. The intestine should be thoroughly examined the entire length, and any wounds found closed with Lembert sutures. If the wound is extensive, as a rupture of the bowel, it should be closed as in enterotomy. In some cases where the bowel wall becomes torn or has an uneven surface, a portion should be removed. (Sec Enterectomy.)

The organs should also be inspected and any wounds in them sutured.

The abdominal cavity should be thoroughly irrigated with a boric acid solution (2 per cent), or normal salt solution, especially in those cases where intestinal contents have escaped or blood is present.

Should the animal be weak from loss of blood, stimulants should be given, such as strychnine sulfate (0.001) repeated as often as necessary.

CROUPOUS ENTERITIS OF CATS

Membranous Enteritis

Definition.—A croupous or membranous inflammation involving the mucous membrane of the intestines.

Etiology.—Croupous enteritis is observed most frequently in kittens occurring as an epizootic in certain districts during the winter and spring seasons of the year. The exact etiological factor has never been determined. It is possibly due to a virulent form of the colon bacillus aided by a reduction in resistance from exposure to cold, irregularities in diet, parasites, etc. Older animals are also occasionally affected but not in such large numbers.

Pathology.—The principal pathological changes are noticed on the mucous membrane of the bowels, the muscular walls, and the mesenteric lymph glands. The mucous membrane is highly congested, reddened, swollen, and the surface covered with a thick membranous exudate. Often the epithelial surface and even the submucosa will become loosened from the other tissues. The wall of the bowel is edematous, and the serous covering shows inflammation. The mesenteric lymph glands are enlarged, edematous, and show acute inflammatory changes. The liver, spleen and kidneys show similar changes. The contents of the bowels are liquid, and contain considerable blood.

Symptoms.—The early symptoms are: vomiting and a severe diarrhea which comes on suddenly and usually affects several animals at the same time. There is a complete loss of appetite, depression, and in twenty-four to forty-eight hours the animals will become very weak, comatose and die from exhaustion.

Diagnosis.—The epizootic character of the disease, the sudden onset and the age of the animal affected are indicative. It can be easily mistaken for various kinds of poisonings; the anamnesis therefore should be carefully ascertained to assist in the differential diagnosis.

Prognosis.—Should be considered unfavorable; the largest percentage of cases terminate fatally.

Treatment.—Treatment of croupous enteritis is as a rule unsatisfactory. Little can be done except the administration of general stimulants and bowel disinfectants. As prophylactic measures, all feeding pans should be thoroughly cleaned and sterilized, and the discharges of the bowels carefully taken care of to prevent further contamination of the food.

CHAPTER X

PARASITES IN THE INTESTINES

IN small animals, parasites in the digestive tract are very numerous. They pass rapidly through the anterior portion of the digestive tract, which prevents their becoming fixed; also in this portion of the canal secretions for their proper development are lacking. In the stomach, owing to its acidity, they do not remain long, but are either destroyed or pass into the small intestines. In a few instances, however, they may burrow underneath the mucosa of the stomach. The intestines are favorable for the development of parasites, owing to their length, the presence of an abundance of fluid, and the slow peristaltic movement of the bowels which does not materially interfere with their fixation and development. The majority of the parasites are found in the small intestines; fewer are found in the cecum, colon and rectum. Each species of parasite has its particular location, and unless in unusual numbers, or under abnormal conditions, they will be found infecting an exclusive portion of the bowel. Parasites are frequently found in very large numbers, and produce serious disturbances in the intestinal tract, depending upon the species of parasite and the animal infected. The parasites most commonly found in the intestinal tract of small animals belong in the following groups: Cestoda; Nematoda; Sporozoa; Trematoda.

CESTODA

The dog is the favorite host of tapeworms. They occur in this animal in considerable numbers, sometimes so as to excite wonder at the continued good health of the host. More than 50 per cent of the dogs examined harbor tapeworm parasites.

It is essential for the tapeworms to have an intermediate host to complete their life cycle. The following animals serve as intermediate host for most of them: sheep, ox, pig, goat, rodents, insects, and even man.

The head (scolex) of a tapeworm is generally globular and supplied with suckers; some species in addition are provided with hooks. From this head, by proliferation, is formed the neck, a thin non-annulated constriction, which, continuing and becoming wider produces the body or strobila. The body is in the form of a long, narrow band divided into more or less distinct segments, and as these become gravid they are cast off gradually from the distal end of the parasite as new segments develop from the head. Each of the gravid segments contain numerous ova which pass out with the feces. Before becoming detached the segments can also liberate ova through an opening on the lateral wall or ventral surface, called the genital pore, forming two ways of disseminating the ova. When deposited in a suitable medium, preferably warm, moist soil, or filth, the ova undergo a series of complicated changes which finally result in the first larval form. In this form they are ingested by the intermediate host, most commonly with the food or water. They burrow through the intestinal wall and migrate into the adjacent tissues, or with the blood stream are carried to

remote parts where they develop into cysts. During the development of the cyst in the various organs serious conditions, such as "gid" in sheep, echinococcus disease of man, etc., may arise in the new host. As the dog is the harbinger of the parent tapeworm, treatment should be given not only to reduce the disorders they occasion in other hosts but also to lessen the injury they produce in the dog. The cyst form is the limit of development in the intermediate host. The life cycle can be completed only in case the cyst is ingested by and reaches the digestive tract of another host in which it can develop.

Cestodes in Dogs.—The most common cestodes found in the dog are as follows: (a) *Dipylidium caninum* (*Tænia cucumerina*), a worm 30 to 40 cm. long and 3 mm. at its greatest breadth. Its club-shaped head is provided with four suckers and four rows of very small hooks. The neck is long and narrow. The first segments are narrow, the others are longer than they are wide and like melon seeds in form. They are usually a light reddish-yellow in color. Genital pores are double and open toward the middle of each side of the segments on a slight prominence. Ova are globular, from 37 to 46 microns in diameter, and pass from the segments massed in small packets. The cyst form is the *Cryptocystis trichodectis* and the intermediate hosts are the dog flea (*Ctenocephalides canis*), cat flea (*Ctenocephalides felis*), dog louse (*Trichodectes canis*) and the flea that lives on man (*Pulex irritans*). These intermediate hosts become infected by ingesting the ova of the tapeworm which are present on the skin or hair of the dog by having fecal discharge mixed with the bedding in the kennel. The cysts develop usually in the abdominal cavity of the intermediate hosts which are in turn swallowed by the dog with water and food, or while licking or biting the skin to relieve the irritation which they produce. They then attach themselves to the walls of the intestine where they develop into the adult worm.

(b) *Tænia pisiformis* (*Tænia serrata*).—This parasite may grow up to 200 cm. in length. Its head is a little broader than the neck, and armed with 24 to 38 hooks. Segments at first are much shorter than broad, about square in the middle portion while the mature segments are 10 to 17 mm. long by 4 to 6 mm. broad. Genital pore on the lateral border, and very prominent, causing the border to appear convex and the segment to be wider in the middle than at the ends. Posterior borders straight and the angles uneven which gives the strobila a saw-like appearance. Eggs are ovoid and 30 to 40 microns long and 31 to 36 microns broad. The cyst form is the *Cysticercus pisiformis* and is frequent in the peritoneal cavity of hares and rabbits. Dogs become infected by eating the viscera and in twelve days the tæniæ are 2 to 3 cm. long, and become mature in two months.

cially ruminants. It requires four to five months to fully develop into the mature worm.

(d) *Tænia multiceps* (*Tænia cænurus*).—This worm rarely exceeds 1 m. in length. Head small, slightly broader than the neck and armed with 22 to 32 hooks. Segments narrower than any of the preceding species, becoming square with the genital pore developed about the 125th segment, 15 to 20 cm. from the head. Mature segments 10 to 12 mm. long, 3 to 4 mm. wide. Eggs spherical 31 to 36 microns in diameter. The cystic form is the *Multiceps multiceps* which is developed in the brain and spinal cord of sheep; more rarely in other domesticated animals, causing the disease commonly called "gid." The cyst is polycephalic, the ingestion of one cyst producing numerous tæniæ. It requires about two to three months to reach maturity.

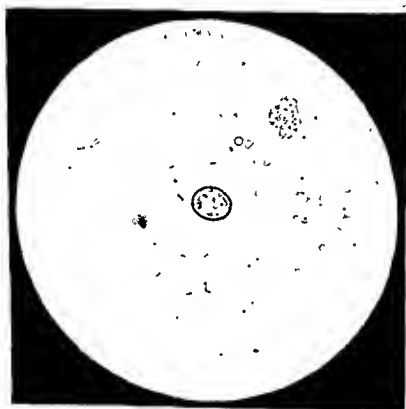


FIG. 9.—*Tænia pisiformis* (tapeworm ova of dog).

in the liver and lungs of ruminants and pigs. It requires one month to fully develop. This cyst is polycephalic and polysomatic.

(g) *Tænia ovis*.—This species is 45 to 110 cm. in length. Its maximum width is 4 to 8.5 mm. The head bears 24 to 36 hooks. The cyst form is the *Cysticercus ovis* and is found in the muscles of sheep.

(h) *Diphylobothrium latum*.—This species is commonly called the "broad tapeworm." It is one of the largest and may be 10 meters in length. The ova are passed from the proglottid, while it is still attached to the chain, and are found in the feces of the host. This tapeworm requires two intermediate hosts, the first, a fresh water crustacean, and the second, a fresh water fish. Infection in the dog is through eating raw fresh water fish containing the infective larva.

Cestodes in Cats.—Two species of cestodes have been found in the cat.

(a) *Tænia taeniaeformis* (*Tænia crassicollis*).—This is the most common tænia found in the cat. It attains a length of 15 to 50 cm. and in appearance is similar to those found in the dog. The head is armed with a double crown of 26 to 52 hooks and is about as wide as the neck. The posterior segments are 8 to 10 mm. long and 5 to 6 mm. wide. Ova are globular and 31 to 37 mm. in diameter. This tænia is represented in the vesicular or bladder form by the *Cysticercus fasciolaris* which inhabits the liver of rats, mice and other rodents. This cysticercus, which is always coiled up in a cyst it has itself produced, is elongated in form, the body composed of segments, and from 3 to 20 cm. long, while the vesicle is ovoid and frequently no larger than a pea.

(b) *Diphylobothrium latum* and *Dipylidium caninum* are commonly found in the cat.

Cestodes in Rabbits.—Cestodes are found in these animals and all belong to one genus, the *Cittotænia*. These may attain the length of 8 cm., head small and supplied with suckers. Segments 1 cm. broad and not so long. Two genital pores are in the posterior part of the segment. The cyst form and intermediate hosts are unknown.

Pathology.—Cestodes are extremely frequent in dogs, but the various species are not equally distributed, and the variation seems to pertain to different countries and also to the different sections of the country. The frequency of cestodes is also directly related to that of the cystic or bladder worms infecting ruminants, rabbits, and other intermediate hosts. The number of individuals by which each of these cestodes may be represented in the same dog is also variable. The *Dipylidium caninum* varies up to 360, the *T. pisiformis* as high as 64, the *T. hydatigena* and the *M. multiceps* usually less than 10, but the *Echinococcus granulosus* from one to several thousand. This variation is due in part to the fact that some cyst forms give rise to but one adult parasite (monocephalic), while others produce many (polycephalic). The common location of the cestode is in the small intestine; only occasionally does it migrate to other parts of the digestive canal. The head is attached to the mucosa by suckers or hooks, and as the body may be folded on itself many times long parasites may only occupy a short distance of the bowel. Large numbers are often massed together almost completely occluding the lumen of the bowel. The mucosa is hyperemic, thickened and covered with mucus. Some of the glands are hypertrophied. Rare cases of perforation of the walls by cestodes have

been reported, but as a rule the pathological changes are those of a chronic enteritis.

Symptoms.—The symptoms vary considerably, but the usual clinical picture is as follows: abdominal pain or chronic enteritis; the appetite may become diminished or, in other cases the animal may become voracious. Dogs often show symptoms of irritation in the abdomen by rolling or rubbing the abdomen on the ground, or by biting at it. Convulsions and epileptiform fits may occur, especially in cats. Unthriftiness, a shaggy coat and emaciation are of frequent occurrence. Ripe segments occurring in the rectum and anal glands frequently produce irritation in dogs and rarely in cats, causing the animal to assume a sitting attitude and to draw the anus over the ground. This rather characteristic symptom is frequently the first observed by the owner.

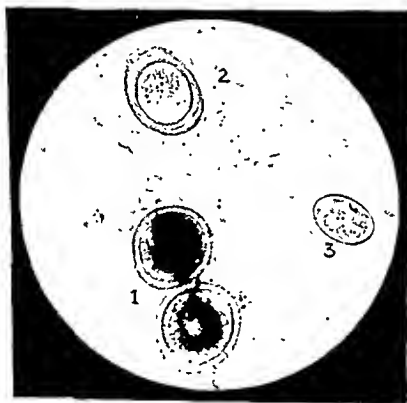


FIG. 10.—Ova of the two common round worms of the dog, also ova of hookworm of dog. 1 *Toxocara canis*; 2 *Toxascaris leonina*; 3 *Ancylostoma canina*.

Nemural is supplied in 18 mg. tablets, each tablet containing 3.13 mg. arsenic. The patient should be weighed accurately and the drug administered orally at the rate of one tablet for each 8 pounds of body weight. Treatment may be repeated after one week, if necessary.

Arecoline hydrobromide is administered in doses from 0.1 to 1 grain, depending on the size of patient. It may be given orally, in tablet form or as a drench. This drug easily causes vomiting, and the patient should be prepared by giving milk for twenty-four hours previous to treatment. The drug should act in from ten to twenty minutes but if no worms are passed by then, it is advisable to repeat the dose and follow in fifteen minutes with an enema.

Tapeworms of dogs and cats are of great importance on account of the diseases caused by their intermediate stages which occur in domestic animals and man. Since the intermediate stages cannot be killed by means of drugs, the regular treatment of dogs and cats, and the extermination of wild animals which harbor the same worms is advisable. Especial efforts should be made to control fleas which serve as the intermediate host of *Dipylidium caninum*.

NEMATODA

Ascaridæ.—Ascarids are common in dogs and cats, especially in puppies and kittens.

Toxocara canis.—This is the common ascarid of dogs and is especially frequent in puppies. These parasites are white or somewhat reddish in color and have an arrow-shaped head due to two short lateral wings. The head is usually curved ventrally. The posterior portion of the male is curved and bears two wings. The female measures from 9 to 18 cm. in length, and the male from 5 to 10 cm. The eggs are globular, 75 to 80 microns in diameter, and have a finely corrugated or pitted shell, light brown in color.

Life-cycle.—The eggs of *Toxocara canis* are deposited by the female worm and are passed from the dog with the feces. Under natural conditions the development of the embryo may take place in water or soil. The ova are extremely resistant and may remain viable for considerable periods. Dogs become infected by ingesting these embryonated eggs with food or water. The ova hatch in the small intestine within a few hours after ingestion. The larvæ burrow into the wall of the intestine and enter the lymphatic vessels, and gain access to the general circulation. They are then carried to the lungs, where they break into the alveoli, and undergo further development. They then pass on to the intestine by way of the trachea, esophagus, and stomach, and develop into adult worms. Infection with this parasite commonly occurs in utero, hence the frequency of this species in very young puppies.

Toxocara mystax.—This is a closely related species to *Toxocara canis* and is parasitic in the intestine of cats. It is smaller than *Toxocara canis*, but has the same life cycle.

Toxascaris leonina.—This is found in the small intestine of the dog and cat. The males measure 7 cm. in length and the females up to 10 cm. It closely resembles the *Toxocara canis*. The ova are slightly oval, have smooth shells, no coloration, and the protoplasm is contracted to one edge of the shell. Life cycle is similar to that of *Toxocara canis*.

Pathology.—Young animals which have died from the disorder caused by the ascarids, may show on autopsy large numbers of this parasite which almost occlude the lumen of the bowel. The stomach may also contain many of them. They are found scattered along the intestines or coiled up in masses. The mucous membrane shows a severe enteritis with numerous ecchymoses and many small ulcerations. The intestines contain no food, only a slimy mucus in which are found the parasites. In older dogs the parasites are fewer in number and are found scattered along the entire length of the intestine and rarely cause much change in the mucosa.

Symptoms.—Puppies and kittens show symptoms of inanition at three to five weeks of age. They are stupid and do not play as such animals usually do at this age. Vomiting is common and quite often some of the parasites are thus expelled. Emaciation increases, the mucous membranes are anemic, and the abdomen appears enlarged ("pot bellied"). Diarrhea is not uncommon, often alternating with constipation. Quite frequently the patients, especially kittens, show epileptiform or rabiform symptoms. These are probably due to the irritation of the nervous system produced by toxins excreted by the parasites as well as by the irritation of the intestines they inhabit. These symptoms gradually become more severe, and finally food is refused, followed by weakness, coma and death in five to eight weeks. The temperature is only slightly elevated in the early stages, later as coma comes on it is subnormal.

In mild cases or in older dogs the symptoms are less intensive, and often unnoticed. The appetite remains good, often voracious, but the general condition is not the best; the hair coat dull and rough and the growth impaired.

Diagnosis.—This can only be positively made by finding the ova in the feces or the parasites in the feces or vomitus; or on postmortem examination.

Prognosis.—Severe infection in young animals is very unfavorable. Ascariasis causes greater loss among puppies and kittens than any other disease. Entire litters often succumb at four to eight weeks of age, and in some kennels it is almost impossible to rear young animals due to this parasite.

Treatment.—A compound containing oil of chenopodium has given excellent results in removing ascarids from the dog and cat. The formula is as follows:

Oil of Chenopodium	8 cc.
Oil of Anise	15 cc.
Oil of Turpentine	7 cc.
Castor Oil q. s.	500 cc.

This compound is given at the rate of 1.5 cc. per pound of animal weight. This should be given after food has been withheld eighteen to twenty-four hours.

Tricladanthelmans (0.1 cc. per pound of animal weight)

conditions at this time being unfavorable to their development. Frequent examinations of the feces should be made and treatment applied when necessary. All additions to the kennel should be examined and treated before being allowed with the other animals.

Pregnant animals should be entirely freed of all parasites, and thoroughly washed to remove all ova that may be on the hair or skin. Afterward remove to a clean place that has not been used for animals for some time where the mother and young should be kept for several weeks. Feed and water, and all receptacles must not be permitted to be soiled by other animals which harbor parasites. In this way it is possible to rear puppies, or kittens without experiencing the trouble with parasites.

Ancylostomidæ.—This family of nematodes inhabits the small intestines, preferring the anterior half, and occasionally is found in the stomach. These parasites attach themselves to the intestinal walls, wound the mucosa, and suck the blood. According to present evidence they produce a poisonous substance which inhibits the coagulation of blood and possibly also injures the host. Inasmuch as these parasites frequently move from place to place, wounding the mucous membrane in many different places, from which hemorrhage continues for some time, a severe anemia is soon produced. These continued injuries to the mucosa soon result in a severe enteritis with all of the symptoms of inanition.

The adult parasite in the intestine lays numerous ova which are passed out with the fecal material. After a short time (eight hours to several days), the period varying according to conditions of heat and moisture, an embryo develops in each egg. The embryo soon breaks through the shell. In the soil it undergoes a change in two or three days, and another in about a week, during which time it also becomes larger. This stage is known as the infective stage. The parasite may live in this condition for five months or longer. Infection may occur *via* the mouth, the embryo being taken with the food or drink; also by burrowing through the skin or mucous membrane and by following the blood stream finally reaching the intestines. In experimental cases the worm has been found in the intestines in eight to fourteen days after skin infection.

Ancylostoma caninum.—This is one of the most widely distributed and destructive parasites of dogs and cats. It is characterized by its well developed buccal capsule with three pairs of curved teeth on the ventral wall and one pair of dorsal teeth. The body of the living worm is usually white or gray in color and occasionally the posterior two-thirds is bright red due to fresh blood in the intestinal tract. The males measure from 8 to 11 mm. in length and the females 10 to 13 mm. The vulva is situated near the posterior third of the body. The eggs are elliptical in shape with a transparent shell, and measure from 50 to 60 microns in length and 34 to 40 microns in breadth.

Uncinaria stenocephala.—This species is smaller than the above and less common. The male measures 5 to 8.5 microns in length and the female 7 to 12 microns. The eggs have about the same appearance as the *A. caninum*.

Ancylostoma braziliense.—This parasite is commonly found in various countries including the Southern United States. It is smaller than the *A. caninum*.

Pathology.—Anemia and cachexia are conspicuous, also edema and ascites are frequently seen. The liver has a light brown color and shows fatty changes. The intestinal contents are hemorrhagic. The mucosa is usually swollen, covered with mucus, and shows numerous small hemorrhagic areas. The worms are found attached to the mucosa, or sometimes free, and their color is gray or reddish, depending on the amount of blood in their intestines.

Symptoms.—Ancylostomiasis is seen in animals of all ages. In animals that are very susceptible, the disease may be acute and rapidly fatal, while some animals have a marked resistance to the effects of the infection. Anemia, general weakness and emaciation are the chief symptoms. In the latter stages, a marked eosinophilia occurs. The hair coat is dry and harsh and the skin shows a scaly condition. The feces are diarrhetic and contain bloody mucus, or they may be tarry in nature. Death is usually preceded by marked weakness and extreme paleness of the mucous membrane.

Diagnosis.—Ancylostomiasis is easily mistaken for non-parasitic anemia. The diagnosis really depends upon the finding of the ova or the parasites.

Prognosis.—If the condition is recognized early and treatment administered, the prognosis is favorable. In those cases showing extreme emaciation and exhaustion the prognosis is bad.

Treatment.—Tetrachlorethylene at the rate of 0.1 cc. per pound of weight is the most satisfactory drug in use. It should be administered in gelatin capsules and should be followed in one and one-half to two hours by a dose of magnesium sulfate.

Hexylresorcinol has recently been suggested for the elimination of hookworms, and has given promising experimental results, but more work needs to be done before it is used too freely.

Nutritious and easily digested food (lean meat, rice soup, cooked vegetables) should be given to build the resistance. Stomachic tonics as iron, quinine citrate, tincture gentian compound are useful to stimulate the appetite. Thorough cleaning and disinfection of the kennels is very important to prevent reinfection.

Trichuridæ.—The members of this group are characterized by a body more or less divided into an esophageal portion and a posterior portion which contains the other organs. They include the parasites which are commonly called "whipworms," due to the anterior end being attenuated to a point which gives it a whip-like appearance.

the cecum, and rests in the glands for several days. It then passes into the lumen of the cecum and develops to maturity. Eggs may appear in the host's feces thirty-six days after infection.

***Trichuris campanula*.**—This species is somewhat smaller than the *T. vulpis*, and not commonly found. It has the same general characteristics as *T. vulpis*.

***Trichuris leporis*.**—This species is found in the cecum, and is smaller than that of the dog.

Pathology.—These parasites are usually found in the cecum and large intestines but rarely in large numbers. In several cases of parasitic anemia in which whipworms occur other parasites are usually also present. The whipworms are found partly coiled up and attached to the mucous membranes of the posterior bowel. The mucous membrane is slightly thickened and shows small areas of inflammation from the injury produced by the parasites.

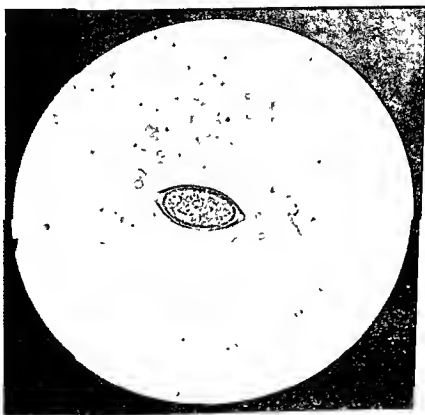


FIG. 11.—*Trichuris vulpis* (whipworm ova of dog).

tion is repeated a number of times until many parasites are produced. Eventually some of the merozoites become differentiated into male and female forms. The male cell fertilizes the female and the oocyst is formed, which is passed out with the feces of the host animal.

Pathology.—The lesions found on postmortem are variable and not diagnostic in themselves. The intestinal mucosa may show diffuse hemorrhagic areas and some investigators have reported finding ulceration of the intestine. Microscopic examination of sections of intestine shows a destruction of epithelial tissue.

Symptoms.—Many animals in apparently perfect health are found to harbor coccidia, and it is probable that, having survived an acute infection, they have adapted themselves to the parasite, and are able to repair the damage done to the cells as quickly as it takes place. The most common symptom is diarrhea, which may at times be bloody in character. In some cases, there may be a rise in temperature, but this is variable. When diarrhea is profuse, the animal shows extreme weakness, general depression and anemia. In chronic cases, diarrhea and emaciation are the external manifestations.

Diagnosis.—A positive diagnosis is only made by the finding of the oöcysts in the fresh intestinal contents or voided feces. The oöcysts may be mistaken for the ova of worms, which they resemble in the thickness of the capsule and the granular nature of the cytoplasm. The oöcysts, however, are generally considerably smaller than the ova with which they may be confused. If the material in which oocysts occur is kept at ordinary atmospheric temperature for a few days, the formation of sporozoites will have taken place and positive identification can be made.

Treatment.—Although the medicinal treatment of coccidiosis in the dog and cat is generally unsatisfactory, it has been noted that infections are commonly self-limited. The reproduction of merozoites in the host ceases after four or five generations and the infection terminates, providing the animal does not ingest a new supply of oocysts. It is, therefore, advisable to employ strict sanitary measures in order that the food and drink be not contaminated with infective oöcysts.

Some excellent results have been obtained with the use of powdered cinchona bark (10 to 60 grains).

in a limited area. Practically all the methods devised are based on sedimentation and flotation.

Advantages of Concentration.—The purpose, too, of any modification of the "smear method" is to attain concentration of the ova. Although this takes more time in preparation of the feces for microscopic examination, it assures greater accuracy because various objects are eliminated which may be mistaken for ova. It also requires less time for the examination of the slide. The following apparatus and material are needed in this method:

1. Microscope: the usual type having a low- and high-power magnification of approximately 100 and 400 diameters.
2. Glass slides: 1 x 3 inches.
3. Cover-slips: $\frac{3}{4}$ inch squares.
4. Wire gauze strainer: 30 meshes per linear inch.
5. Several containers: 100-cc. capacity.
6. Several vials with flat bottoms (the ordinary sputum vial is ideal for this purpose).
7. Saturated sodium nitrate or saturated sodium chloride solution.

Technique of Fecal Examination.—1. Mix the feces with water until they reach a fluid consistency.

2. Strain through wire or cloth gauze.

3. Place equal volume of fecal mixture and sodium chloride or sodium nitrate solution in a sputum vial and mix well.

4. Place a glass slide (1 x 3 inches) on sputum vial, which should contain enough of fecal mixture to touch the glass slide.

5. The glass slide should remain on the sputum vial for at least five minutes. It is then ready to examine. The slide is inverted being careful not to lose the material clinging to it. No cover-slip is necessary, unless the high power objective is being used.

Factors Which Interfere with the Examination.—Fecal examinations are not infallible, and certain factors must be considered in forming conclusions. It is possible to have parasitic infections and yet find no ova. The parasites present may be immature, and not producing ova; or, if diarrhea is present, the stool may be so diluted that the finding of ova is difficult.

Tapeworms usually pass their ova within the segments, therefore, it is always advisable to examine the feces carefully to ascertain whether segments are present.

Oil used for laxative purposes may interfere with the examination, because oily substances will float to the surface of the tube contents.

Finally, all tubes, beakers, and sieves must be thoroughly cleaned and then rinsed with sealding water, so that ova from one examination will not be carried over to the next.

CHAPTER XI

DISEASES OF THE RECTUM AND ANUS

Examination.—These parts are quite readily examined in all small animals. The anus by inspection and palpation for enlargements and abscess formation in the anal glands, congenital occlusion in puppies, pseudocoprostasis, inflammation at the anal opening, foreign bodies and parasites.

The rectum is best examined as follows: (a) direct palpation. The gloved index finger is inserted as far as possible to determine the condition of the mucosa, the presence of foreign bodies, parasites, fecal matter, blood, etc. (b) A rectal speculum is used to dilate the anus and rectum. By using reflected light (mirror) the mucosa can be directly examined for inflammations, tumors, parasites, foreign bodies, etc. (c) Palpation through the abdominal walls will admit of an examination of the anterior portion of the rectum. It can easily be distinguished from the other tissues, and quite readily inspected in this location for fecal accumulations, foreign bodies, etc. (d) Laparotomy when performed just anterior to the pubis, in the median line of females, and to either side of the penis in males, will allow direct inspection of the rectum for inflammations, tumors, fecal accumulations, etc.

OCCCLUSION OF THE RECTUM AND ANUS

(a) A congenital occlusion of the rectum and anus has been observed quite frequently in puppies. Imperforate anus is most common. This condition exists at birth and is the result of improper development during fetal life. The rectum is formed from the hypoblastic and mesoblastic embryonic layers while the anus is developed by the invagination of the epiblastic which, as the development progresses, joins the rectum by absorption of the intervening septum. Anything which interferes with the normal development would produce imperforate anus. Sometimes the fetal development will be interfered with sufficiently to produce occlusion of both the rectum and anus.

(b) An artificial occlusion of the rectum and anus (pseudocoprostasis) occurs occasionally in long-haired dogs (poodles), and cats (angoras) from the hair becoming agglutinated with fecal matter which becomes dry and forms a firm film or plaster over the anal opening interfering with defecation. Also occasionally foreign bodies (splinters of bone, needles, pins, etc.) are found which have successfully passed other portions of the alimentary tract only to become lodged at or near the anal opening interfering with the passage of the feces.

Symptoms.—The congenital occlusion is seldom observed until there is persistent and ineffectual attempts at defecation. Puppies when examined carefully will be found to have the rectum distended with feces and an absence of an anal opening, the skin being pouched out where the anal opening should be. However, should the rectum and anus both be imperforate the enlargement will be absent. The abdomen becomes distended.

and they refuse to nurse. A careful examination will at once reveal the condition. There is more difficulty in recognizing an occlusion of the rectum, but by passing a small probe or sound the condition can be definitely determined.

In artificial occlusion (pseudocoprostasis) the principal symptom is the persistent attempts at defecation without the passage of fecal matter. A careful inspection of the anal region will at once reveal a collection of feces and the matted hair. This condition if persistent will produce symptoms similar to constipation or obstipation. (See Constipation.)

Diagnosis.—The diagnosis is quite readily established by a careful inspection of the parts involved.

Prognosis.—Favorable, except in congenital deformity of the rectum.

Treatment.—In imperforate anus, an X-shaped incision should be made over the point distended by the feces. Care should be taken to prevent injuring the sphincter muscle. The flaps of skin should be either trimmed off to form a circular opening, or stitched back to prevent adhesions taking place. The passage of a small sound daily, keeping the edges of the wound well lubricated with vaseline, or the direct application of silver nitrate every day or two, will prevent adhesions. In cases where the rectum is also involved, treatment is not to be attempted.

Artificial occlusion from collections of feces can be removed by clipping away the hair from around the anal opening, softening the hardened mass by the use of warm water, and administering a purgative or allowing laxative foods for a few days.

When foreign bodies are present, a careful examination should be made to determine their size and character. They should be removed carefully to prevent laceration of the tissues.

A purgative is advisable, and if the foreign body has led to atony of the walls of the lower bowels, small doses of strychnine sulfate (0.0005 to 0.001) should be administered daily.

PROCTITIS

Definition.—An acute inflammation of the mucous membrane of the rectum.

Etiology.—Proctitis is observed quite commonly in the dog and cat and results usually from the same causes that produce inflammation of other parts of the alimentary tract. Also, it occurs frequently from direct injuries, such as insertion of the thermometer, careless manipulation with the finger, frequent passing of catheters or sounds, or the injections of too strong antiseptic solutions or soapy water, etc. All of these conditions will produce a more or less severe proctitis depending upon the amount of injury done to the mucosa.

Pathology.—The mucous membrane becomes reddened and congested especially at the apex of the folds; hemorrhages and erosions are often observed. Hemorrhages take place from the mucous membrane, and occasionally small or copious quantities are ejected from the rectum. In severe forms, due to poisons, infections, etc., the epithelium becomes desquamated, and quantities of it will become loosened from the submucosa. Further, when due to injuries, the lesions are usually confined to the lower part of the rectum, and depend upon the extent of injury.

Symptoms.—Difficult and painful defecation with frequent attempts at defecating and only a small quantity of feces being passed. The feces are streaked or covered with blood. Edema of the mucosa, which can be seen slightly pouching out through the anal opening. Direct examination reveals the painful, inflamed mucous membrane. Digital examination produces severe pain. Through the rectal speculum the mucous membrane will be found highly congested, swollen and the surface covered with dark, bloody fecal matter.

Diagnosis.—This is not difficult as a direct examination will readily detect the inflammatory condition.

Prognosis.—Usually favorable when localized in the rectum. However, a careful examination should be made of the other portions of the digestive tract before a positive prognosis is made. It depends also somewhat upon the cause and the extent of injury to the mucosa and the adjacent structures.

Treatment.—The cause should first be found if possible, and removed, to prevent further injury and irritation to the mucous membrane.

Rectal injections of mild astringent and antiseptic solutions (alum 1 to 2 per cent, boric acid 2 per cent) are indicated. These should be introduced with a syringe having a blunt, well-rounded nozzle, and the injection made slowly, only a small quantity at each time. The fluid should be at or near the body temperature to avoid straining.

Tincture of opium is indicated as an injection when pain is severe, to allay irritation and to prevent straining. A solution of 1 part tincture opium to 30 parts water will be found useful for this condition. This injection should be repeated as often as necessary.

In some cases it is advisable, where irritants are suspected of being present, to irrigate the rectum with warm water or a bicarbonate of soda solution (2 per cent).

HEMORRHOIDS (PILES)

Definition.—Hemorrhoids are varicose or dilated veins of the hemorrhoidal plexus. According to their location they are termed external, internal or mixed. External hemorrhoids are located outside the sphincter ani and in the subcutaneous tissue, while internal hemorrhoids are located inside the sphincter muscle and under the mucous membrane. The mixed variety consists of both of the above appearing at the same time.

Etiology.—This condition is commonest in old dogs, and results most frequently from obstructions to the portal circulation, through constipation, congestion of the liver, proctitis, enlarged prostate glands, or chronic cardiac diseases. All of these conditions, from a defective circulation to the parts involved, lead to a venous stasis with a resultant distention of the veins of the hemorrhoidal plexus.

Pathology.—The external variety is usually made up chiefly of hypertrophied perirectal connective tissue, appearing as small cutaneous projections, involving the external veins, which become distended or rupture, forming a soft tumor-like mass. The internal variety consists of numerous distended vessels, increased connective tissue formation, which often show an ulcerating surface, and are sometimes found projecting through the anal opening. Hemorrhages often take place readily from them, through irritation by the passage of fecal material.

Symptoms.—The act of defecation is usually very painful, the feces being covered with blood, or a quantity of blood passed following the feces. Sometimes defecation is stopped entirely from the severe pain which is induced by it. Pruritus is also a prominent symptom, the animal biting or licking the parts, or sliding the anus along the floor. Direct inspection of the parts reveals the presence of the hemorrhoidal enlargements, which appear as bluish-red knots encircling the rectum. If external, the enlargements will be noticed on either side of the anal opening. Rectal examination is very painful (different from rectal polypi, or other neoplasms, which are occasionally found in this location).

Diagnosis.—This is usually not difficult, as the parts can be readily inspected.

Prognosis.—When appearing in old animals a complete recovery seldom takes place as the causes are difficult to eliminate. However, in recent cases, or in younger animals, the prognosis is more favorable, as a number of the cases are amenable to treatment.

Treatment.—The early indications in the treatment are to regulate the bowels by the use of saline laxatives (magnesium sulfate, dog 8. to 12.), and laxative foods (soups, etc.) to overcome constipation.

Enemas of cold water are also useful to relieve the congestion and irritation. Zinc oxide ointment also will be found valuable for its astringent and lubricating properties, as well as an ointment consisting of the following:

Zinc oxide	. . . . .	1 ounce
Tannic acid	. . . . .	20 grains
Menthol	. . . . .	5 grains
Phenol	. . . . .	10 minims

Should the internal hemorrhoids protrude into the canal or through the anal opening, they should be grasped with the forceps, drawn out through the anal opening, and ligated (see Prolapse of the Rectum). In some cases where ligation is impracticable, the rectum is dilated with a speculum and the actual cautery applied, care being taken to prevent injuring the adjacent tissues.

In external hemorrhoids, it is advisable to operate by dissecting around them carefully, ligating them firmly at the base with sterile silk or linen, removing the ligated portion and suturing the skin wound. Should blood clots or abscesses form they should be opened and treated with antiseptic solutions.

mainly to excessive straining during constipation, in diarrhea, enteritis, etc. This is common in old dogs from unduly straining during the course of chronic constipation, diarrhea, hemorrhoids, urethral stricture, enlarged prostate glands, rectal tumors, labor pains, or after the use of irritating or hot rectal injections or infusions. Sometimes these causes not only lead to prolapsus or intussusception of the rectum, but other portions of the bowels may be involved, and protrude through the anal opening. (See Intussusception.)

Symptoms.—Mild cases of eversion of the rectal mucosa are hardly noticeable, except when the animal strains, when the enlargement becomes visible. In more severe cases, the rectal mucosa will appear as a rounded, congested enlargement, protruding through the anal opening. The condition of the mucosa will depend greatly upon the length of time it has been everted. On close inspection, the mucosa will usually be found to be everted only from one side of the rectum, or in rare instances may be the entire mucosa. It will be found congested, of dark color, hemorrhagic, the external covering desquamated and often hanging in thin shreds. Often the surface bleeds when the parts are manipulated. Necrosis may result from exposure, or from the blood supply becoming reduced by the swelling. An eversion of the rectum will at once be recognized by the curved, cylinder-like bowel which protrudes. Some feces will be passed, and will collect around the orifice of the canal. Longer exposure (twenty-four to forty-eight hours) will often lead to induration, with foci of ulceration, gangrene, beginning as a rule at the apex of prolapsed portion. The progressive changes which develop will depend very largely upon the length of time the bowel remains exposed.

Diagnosis.—This is not difficult as a close inspection of the parts involved will at once reveal the condition.

Prognosis.—An eversion of the mucosa is always considered favorable, recovery taking place promptly. However, if the causes persist, in some cases the eversion of the mucosa may be followed by a prolapsus of the rectum.

suture applied through the base and tied either way around the enlargement. The ligature should be applied rather firmly to prevent hemorrhage and retraction of the tissues which would loosen it. The ligated portion is then removed with the scissors. The base is returned to the rectum and treated with antiseptic and astringent solutions.

Prolapsus of the rectum is often quite difficult to reduce. When taken early, before much swelling has taken place, it can usually be pushed back into place, by digital kneading, or by the use of a bougie or a well-rounded sound. Placing the animal in a pendent position with the head downward, will assist in the replacement. When the parts are in position, it is advisable to resort to some method of retaining them in place for a time, otherwise they are quite liable to be thrown out again by the animal straining. A tobacco-pouch suture, which is used to constrict the anal opening, is often used successfully, making the constriction just sufficient to hold the parts in position, and to allow soft or liquid feces to be passed. However, as soon as this suture is removed the prolapsus often recurs.

Should these methods fail to replace the prolapsed rectum, or hold it in position, laparotomy should be performed (see Laparotomy), and the prolapsed bowel returned to its proper position by gentle traction. The bowel when returned to the cavity should be held in place by suturing same to the abdominal wall (ventrofixation). The sutures should be applied carefully so that they only pass through the serous and muscular coats of the bowel. Several of these sutures should be applied to firmly fix the bowel in position. Laxatives or laxative foods are indicated to prevent constipation and pressure on the posterior bowels. Should the prolapsed portion be much swollen, necrotic, or severely inflamed, this method is not advisable, as it would act as a foreign body and induce severe straining, resulting in a repetition of the former condition. Should the prolapsed portion show evidences of marked pathological changes, it is advisable to resort to amputation, which is done in the following manner: the animal is given a general anesthetic, placed on the table in a ventral position, and the parts involved thoroughly cleansed with an antiseptic solution. The prolapsed bowel is then grasped with a bowel clamp, gentle traction used until normal tissues appear, and a previously sterilized small rubber tube applied close to the anus, to act as a tourniquet. A circular incision should be made through the external intestinal wall, a short distance posterior to the tourniquet, and parallel to the anal margin. Seize the severed external tube at the anal margin with small hemostatic forceps, to prevent its retraction and draw it out gently to bring its serous coat in contact with the serous coat of the internal tube. These two surfaces should be sutured using sterilized catgut, silk or linen, making interrupted sutures the entire circumference of the incised portion. Care should be taken in inserting these stitches, as they should only pass through the serous and muscular coats. When this is completed, the outer tube is cut off with the scissors distal but close to the row of stitches. The mucous surfaces are then approximated with continuous or interrupted sutures, and the stump thoroughly cleansed with antiseptics and returned within the anus.

Should hemorrhage occur during the operation all vessels should be ligated, as the persistent hemorrhage interferes with the application of the sutures. The after-treatment consists in the daily injection of small quantities of antiseptic solutions.

Another successful method of procedure is to insert a sound of proper size, depending upon the size of the animal, into the lumen of the canal; apply a tourniquet rather firmly around the prolapsed portion close to the anal margin to control the hemorrhage, and to prevent the wall from retracting. The prolapsed portion is then amputated rather close to the tourniquet. A continuous suture is applied around the margin of the incised portion, the stitches placed close together and including enough of the tissues so that the serous coats will be brought in apposition. The tourniquet and sound are removed and the stump replaced within the anus. Antiseptic and astringent solutions should be used for a few days.

of the anus. In old animals the secreting membrane often becomes inflamed or irritated from constipation, foreign bodies, infection, etc., which changes the character of the secreted material. From infection, the secretion becomes purulent and the orifice partially or completely closed giving rise to a retention of the secretion, and swelling. In some cases an increase of the secretion may result, causing discharge which collects on the margin of the anus or soils the hair around the anal region. Sometimes when the orifices become closed, and no outlet is left for the escape of the discharge, the skin perforates over the enlargement forming an exit for the escape of the discharge. Thus a fistulous tract may form. Painful defecation is noted, or, if the pain is great, severe constipation results. There are frequent attempts at defecation, and pruritus. Direct examination reveals the presence of a hot, sensitive, fluctuating enlargement or there may be a fistula present. The discharge is noted when it collects on the hair around the anus and tail which it stains, and an offensive odor is emitted.

Diagnosis.—Usually not difficult as a direct examination will reveal the condition; not uncommonly the condition is bilateral.

Treatment.—When the enlargement is present, the contents of the sac should be expelled by pressure with the thumb and finger. The use of rubber gloves is recommended. This should be repeated daily for several days in case the sac shows a tendency to refill. If necessary to stop the discharge, Lugol's solution or tincture of iodine should be injected with a hypodermic syringe, enough of either to slightly distend the sacs. This treatment can be repeated in a few days if necessary.

Should a fistulous tract be found, it should first be thoroughly cleansed with an antiseptic solution (boric acid 2 per cent) to remove all of the secretions, etc., then injected with Lugol's solution or mercurochrome.

This treatment should be repeated every few days until the discharge ceases. If case is still persistent, a surgical operation may be performed.

CHAPTER XII

DISEASES OF THE LIVER

Examination.—The liver is examined by:

(a) *Palpation.*—This method is not very satisfactory owing to the well protected position of the liver, and the thickness of the abdominal muscles over it. However, when the liver is much enlarged from acute inflammation, etc., it is possible to palpate it through the walls.

(b) *Laparotomy.*—When a thorough examination of the liver is desired this method is much more satisfactory than by palpation. The incision is made just posterior to the xiphoid cartilage, same as for gastrotomy, and long enough to admit of a thorough examination. The liver should be examined for inflammations, atrophy, cirrhosis, foreign bodies, abscesses, tumors, injuries, etc.

most commonly from the following: in many infections, such as the different types of infectious icterus; distemper (partly obstructive, by producing a catarrhal inflammation of the duodenum); pyemia, in the different forms of intoxications, poisonings by ptomaines, mineral poisons (phosphorus, arsenic, coal-tar products, etc.); pernicious anemia; hemoglobinemia; disturbance of the circulation, such as passive congestion; some nervous diseases, whereby the function of the liver is modified.

Pathology.—Yellow discoloration of all the organs and tissues by the bile pigment with the exception of some of the nervous and corneal tissue, characterizes the postmortem. The discoloration varies from a slight tinge of yellow to a deep greenish-yellow, depending upon the amount of bile pigment deposited. Catarrhal inflammation of the stomach and duodenum is often observed, the mucous membrane swollen, the blood-vessels congested, and as a rule the mouth of the hepatic duct will be found closed from the swelling of the mucosa. The duct itself is often found occluded from a swelling of its membranes from infection, parasites, foreign bodies, gall stones, etc. The duct is usually partially filled with a thick, syrupy, or semi-solid mass of bile and mucus. The liver is usually found enlarged, and varies in color from a diffuse light yellow to yellowish-brown, or the color may be irregularly distributed causing a mottled appearance. The bowel contents are light gray or slate-gray in color, owing to the absence of bile, and emit a fetid odor.

Symptoms.—The early manifestations of icterus depend largely upon the underlying causes of which jaundice is merely a symptom. All of the tissues and organs, with the exception of the nervous, are stained with biliary pigments; in very severe cases where infection is the cause the nervous system may also be stained. The discoloration is most noticeable in the skin and mucous membrane.

Mucous Membranes and Skin.—Icterus is first manifested by a yellowish discoloration of the eye involving the conjunctiva and sclera. In very mild cases a slight tinge of yellow noticed on the conjunctiva may be the only symptom of the condition. As a rule, as the disease progresses the other visible mucous membranes will also show the yellowish discoloration. In the dog the membranes of the mouth will be colored yellow. The skin, especially if non-pigmented, becomes a characteristic light yellow, or greenish-yellow depending upon the amount of bile pigment distributed. The discoloration is seen early on the skin of the abdomen, thighs, and ultimately over the entire body. In dark-skinned animals the condition can also be observed, the skin assuming a dark olive-green color. The color of the skin may assist somewhat in arriving at the possible etiological factor, as the discoloration is usually light in the toxic or hemohepatogenous icterus, while it usually is darkest when the ducts are completely obstructed—hepatogenous icterus. The intensity of the external symptoms, therefore, is in proportion to the completeness of the obstruction to the ducts and to the extent of the rupturing of the biliary capillaries. The symptoms develop on the external membranes, as a rule, in a few hours, although in some cases of slow development three to four days may be required depending upon the degree of infection or obstruction of the ducts.

The Urine.—This is changed in color to a yellowish-green, dark green, yellowish-red, or greenish-brown, depending upon the amounts of bilirubin, biliverdin (oxidation products), or urobilin (reduction product). These

small quantities of milk, are useful. During convalescence foods should be allowed only in small quantities, avoiding fats and irritating foods as much as possible.

Medical.—When ieterus is the result of catarrhal inflammation of the duodenum, it is advisable to irrigate the stomach with bicarbonate of soda solution (2 per cent), repeating this operation until all mucus is dissolved and the liquid flows out clear. This treatment should be used at least once or twice daily. Following the stomach lavage Carlsbad salts (0.5 to 2.) are useful to stimulate secretions and to dissolve the mucus accumulated on the mucous membrane of the stomach and duodenum. In some cases this will be sufficient to allow the escape of the bile into the duodenum.

Injections of warm water or warm bicarbonate of soda solution (2 per cent) into the rectum as high up as possible are often valuable to stimulate peristalsis, encourage defecation, and to produce alkalinity of the intestinal contents.

Should constipation be present calomel (dog, 0.3 to 0.4; cat, 0.1 to 0.15) should be given and repeated in twelve to fifteen hours if catharsis has not been established. Magnesium sulfate (dog, 8. to 16.; cat, 1. to 4.) or castor oil (dog, 15. to 16.; cat, 5. to 20.) may be used for the same purpose.

In severe cases it is advisable to try to overcome the obstruction to the duct and empty the gall-bladder, either by mechanically compressing the liver by manipulation or by the use of emetics. The latter method has proved to be the most satisfactory. The action of the emetic by contracting the abdominal muscles will often exert enough pressure upon the liver and gall-bladder to force the bile out into the bowel. An obstruction, such as mucus, parasites, foreign bodies, etc., can thus also often be removed.

When the bile pigments are deposited in the body in large quantities, or the blood contains a large amount of undeposited bile salts, its elimination should be encouraged by the use of diuretics. Potassium acetate or nitrate (dog, 0.2 to 0.5; cat, 0.05 to 0.1) is to be given twice daily.

General stimulants, such as camphor or ether, are indicated when general depression and coma are observed.

More recently, decholin sodium, a 20 per cent solution of the sodium salt of dehydrocholic acid has been used in cases of non-obstructive ieterus. The dose is from 1 to 5 cc. depending upon the size of the animal. It is injected intravenously for three successive days, the second and third doses sometimes being larger than the first. Very favorable results are often obtained by this treatment and decholin being non-toxic may be used with safety.

In severe cases normal salt solution given as an intravenous injection is useful to assist in the elimination of bile and to produce general stimulation.

Paradization of the liver has been tried but its usefulness is questionable.

CONGESTION OF THE LIVER

Two forms of the disease are distinguished: (a) active, and (b) passive.

Active Congestion.—*Definition.*—An engorgement of the liver with blood resulting from an increased circulation through the portal vein or hepatic artery.

Etiology.—There are a number of etiological factors in active congestion of the liver: (a) during the process of digestion there is a physiological

increase in the amount of blood carried to the liver by the portal vein. This, however, usually subsides after digestion is completed. In small animals, owing to the great variation in the amount and quality of food taken, and the fact that the food often contains irritating material, toxins, ptomaines, etc., all of which increase the functional activity of the liver, a more or less permanent active congestion results. (b) Various poisons provoke a severe form of congestion of the liver. These include many autogenic poisons carried to the liver from the intestinal tract by the portal vein, or certain ptomaines preformed in the food before it is ingested. Mineral poisons (arsenic, mercury, phosphorus) can produce it. Some of the toxic products of infections, which develop in the intestinal tract, will sometimes be carried to the liver in sufficient quantities to excite an acute congestion. (c) Congestion of the liver may also result from the specific products of certain infections (virus of distemper, staphylococci and streptococci) that may reach the liver *via* the general circulation. (d) Dogs, when kept indoors, fed on highly nutritious food, and not receiving the proper amount of exercise, will often develop active congestion of the liver.

Many of the causes mentioned are also the chief etiological factors in producing inflammation of the liver (hepatitis) of which congestion is the first stage.

Pathology.—The liver is enlarged, feels firm or hard, contains an increased amount of blood, and is of a dark red or reddish-brown color. On cut surface, the blood drips or flows off freely.

Symptoms.—Due to the fact that excretion is interfered with, which leads to a general intoxication of the body, general symptoms of stupidity, depression, loss of appetite, etc., appear. Nausea and vomiting are often observed. Constipation is the rule. The feces are clay-colored and have a fetid odor. Jaundice, which is nearly always present, is first noticed in the conjunctiva; the urine is stained yellow with bile pigment. The liver is usually enlarged and by palpation it may be distinguished through the abdominal walls; also is often quite painful to the animal when compressed by digital pressure.

The urine is highly colored (often green), of high specific gravity, and shows precipitates of urates and uric acid. The body temperature is either normal or subnormal.

Diagnosis.—An accurate diagnosis presents some difficulties. The causes (history), the disturbance of the digestive tract, the jaundice, and the enlarged and painful liver, should be considered in arriving at a definite conclusion. In atypical cases an accurate diagnosis is impossible, although enough symptoms may develop to suspect the acute congestion.

Prognosis.—The prognosis is usually favorable, except in those cases produced by poisons and infections. In these the prognosis will depend largely upon the character of the infection or the nature and amount of the poison.

Medical.—Free purgation is indicated early. Magnesium sulfate (dog, 10. to 15.; cat, 1. to 5.) has proved to be the most satisfactory. These doses should be repeated until free catharsis has been established. Calomel may also be used, but is not as good as magnesium sulfate, as its action is more cholagogic which would be contraindicated where congestion of the liver exists. When nausea and vomiting are present, indicating an irritated condition of the stomach and intestinal mucosa, sodium bicarbonate (dog, 0.5 to 1.; cat, 0.2 to 0.8) given three to four times daily is beneficial. Ammonium chloride (dog, 0.5 to 1.2; cat, 0.2 to 0.5) given three times daily will assist in the excretion of the urea, uric acid, etc., and relieve the intestinal catarrh. During convalescence bitter stomachics are indicated to stimulate secretions and to assist in digestion. Intestinal antiseptics, such as salol, are also often indicated.

Passive Congestion.—**Definition.**—A congestion of the liver due to some impediment in the efferent circulation of the blood in the liver.

Etiology.—This condition may result from the following: (a) defective heart action, whether it be acute or chronic, such as valvular insufficiencies. (b) During the course of some diseases of the lungs which increase the work of the right side of the heart, eventually weakening it. Examples are emphysema, chronic bronchitis (common in old dogs), compression by pleural exudates, adhesive pleuritis, tumors of the mediastinum, etc. (c) Local obstruction to the circulation of blood through the hepatic veins and posterior vena cava. The most common are: pleural or peritoneal effusions (when in large quantities, displacing the heart or compressing the veins), tumors of the liver (carcinomata and sarcomata in older animals), adhesions around the liver from abdominal operations, injuries, etc.

Pathology.—The congested liver in the early stages is somewhat increased in size, depending upon the amount of blood contained. The organ is firm, dense and of a bluish or dark purple color.

Cut section shows a more or less uniformly congested, dark blue or purplish color, and presents a mottled appearance with light areas. In the advanced stages there is an excess of blood, and the liver presents the characteristics of the "nutmeg" liver; the intralobular and sublobular venules being distended and filled with blood, appearing as dark blue, purplish or reddish spots, while the liver cells are pale yellowish, or whitish, showing fatty infiltration and biliary pigmentation, which gives the marked contrast in color ("nutmeg" liver). In the most advanced stages, the liver becomes smaller, and may be smaller than normal. It is firm and dense, but still retains the characteristic nutmeg appearance. Connective tissue develops around the central veins; the adjacent hepatic tissue is atrophic and pigmented, and invading it are fine fibrous connective tissue trabeculae. The capsule is often thickened and opaque.

Symptoms.—The symptoms vary greatly, depending largely upon the causes. When due to primary cardiac or pulmonary disease, the symptoms are complicated with these conditions, those of the primary condition usually predominating. The local symptoms are principally loss of appetite, disturbance in digestion, nausea, vomiting, and more or less obstinate constipation. Jaundice is a common symptom. It may be moderate. The cyanosis which is present in the conjunctiva with the jaundice produces a peculiar bluish-green color of the mucous membranes. In cases where

infection develops rapidly, the jaundice increases, often producing nervous symptoms such as excitement, convulsions, etc.

Ascites is a common symptom in the later stages, resulting from the extensive interference with the circulation. A large amount of fluid is often found in the abdominal cavity, especially in dogs. In the early stages the liver is enlarged, while in the more advanced cases it may be atrophied. Examination of the liver, therefore, by palpation may not reveal any characteristic condition. An accompanying gastro-intestinal catarrh develops which interferes with digestion; the chronic course leads to general weakness and emaciation.

Diagnosis.—The diagnosis depends upon finding the primary disease of the heart or lungs, the condition of the liver, and the local symptoms of icterus, gastro-intestinal catarrh, etc. An accurate diagnosis is somewhat difficult. A careful examination of the patient and the prolonged chronic course of the disease will assist in arriving at an accurate conclusion.

Prognosis.—As a rule unfavorable, especially in the dog. It depends upon the primary condition, the stage of the disease and the condition of the animal.

Treatment.—*Dietetic.*—Treatment affords only temporary relief. Encourage the animal to eat by giving small amounts of lean meat, milk, etc., which may be given in conjunction with alkalies (sodium bicarbonate) to conserve the strength.

Medical.—For defective circulation, due to diminished heart action (valvular insufficiency), digitalis fluidextract (dog, 0.1 to 0.3; cat, 0.025 to 0.05 once or twice daily) is the most efficient drug, especially when used in the early stages.

Magnesium sulfate should be given in constipation. Stomachic tonics (gentian, nux vomica) are also indicated.

HEPATITIS

Definition.—An acute or chronic inflammation of the liver. This comprises a series of most diverse conditions varying from active congestion, acute or chronic inflammation, to localized foci of necrosis or to the different forms of icterus gravis.

Etiology.—Hepatitis may result from the many causes enumerated under active congestion of the liver (see Congestion). The only real difference between the conditions is in degree. A clinical differentiation, therefore, may be difficult. Acute hepatitis is most commonly due to the absorption of toxins during the course of infections or specific infectious diseases. It may also result from the absorption of toxic materials, such as poisons, from the intestinal tract (common in dogs).

Chronic interstitial hepatitis may develop from the acute or from valvular disease of the heart.

Pathology.—In acute hepatitis the pathological changes are varied. The whole phenomena of inflammation (congestion, cloudy swelling, focal necrosis, etc.) may be present. In mild cases the liver appears as in active congestion with cloudy swelling. In severe cases the pathological changes are intensified. The liver is enlarged, swollen, softened, and rather pale in color; the cut surface is pale, opaque, and shows mottling, depending upon the degree of inflammation.

Symptoms.—The symptoms are very similar in many respects to those of active congestion of the liver of which acute hepatitis is a more advanced stage. As a rule the symptoms are more intensive than in acute congestion. Nausea and vomiting are more pronounced and usually more persistent; the vomited material often contains a quantity of bile coloring the material a greenish color. Blood may be vomited up along with the other material, from the irritation of the mucous membrane. Constipation is nearly always present. At certain periods in the course of the disease diarrhea may appear. The fecal discharges are very fetid, 'yellowish or clay-colored. Icterus, noticeable on the conjunctiva, mucous membrane of the mouth, and sometimes in the non-pigmented skin, will be a prominent symptom. The liver is found enlarged and sensitive on palpation.

The urine is usually concentrated, highly colored, of increased specific gravity, and contains a high percentage of urates and uric acid as well as bile pigment.

The temperature in the early stages of acute hepatitis is usually quite materially elevated (103° to 104° F.). The fever temperature assists in differentiating the condition from simple congestion. However, in the later stages, the temperature may be found normal, or even subnormal, due to retained toxins, bile salts, etc. The general symptoms are dulness, intense thirst, and gastro-intestinal disturbance.

Diagnosis.—The diagnosis depends on the causes, the elevation of temperature, the enlargement and sensitiveness of the liver, and the general symptoms. To distinguish between acute congestion and inflammation of the liver is difficult and depends upon the severity of the symptoms.

Prognosis.—The prognosis is unfavorable. In some of the milder cases recovery takes place, but when advanced it nearly always proves fatal.

Treatment.—The treatment for active congestion of the liver is applicable. (See Active Congestion of the Liver.)

In chronic hepatitis treatment is valueless.

Suppurative Hepatitis.—*Abscess of the Liver.*—**Definition.**—An inflammation of the liver resulting in abscess formation, which occurs under a variety of circumstances and in several forms. Liver abscesses are commonly divided into two kinds: (a) the large single abscess; (b) the small multiple abscess. Fundamentally, however, the two kinds may not differ from each other, since the large single abscess may become multiple by infecting adjacent liver tissue giving rise to the development of secondary abscesses. By coalescence a number of small abscesses may, by peripheral extension, form a large single abscess.

Etiology.—Liver abscess is always the result of infection by micro-organisms (staphylococci, streptococci) which reach the liver in one of several ways; (a) traumatism. In small animals injuries, direct or indirect, frequently give rise to abscess of the liver. Direct injuries, such as punctured wounds, gunshot wounds, etc., permit the entrance of pyogenic organisms. Indirectly contusions or rupture of the liver, which reduce the resistance to infecting organisms which may be circulating in the hepatic or portal blood. Such usually produces a single, small or medium-sized abscess.

(b) Diseases of contiguous organs often occasion the formation of abscess in the liver. Examples are: gastric or duodenal ulcer with perforation; abdominal organs which have been operated and infected, and suppurative conditions of adjacent organs.

(c) Infection *via* the portal or hepatic circulation. Multiple abscesses result from gangrene or abscess of the lungs, purulent pleuritis, purulent and fetid bronchitis, etc. These processes give rise to many infectious emboli which lodge in the liver, forming abscesses.

(d) Infection *via* the biliary ducts. Here abscess formation is due to the infection carried in through the bile ducts, or by direct extension of ulcerative and suppurative processes in the biliary tract to the adjacent liver tissue.

(e) In some cases infection may take place through the lymphatics.

Pathology.—The appearance of the liver will vary greatly, depending upon the mode of infection, the virulence of the infecting material, and the location and number of abscesses.

Abscesses resulting from traumatism, ulcerative and suppurative processes in adjacent organs are usually single, small or of moderate size, and mostly superficial. These abscesses are in isolated areas, a focus of inflammation surrounded by a zone of intense hyperemia. In or near the center liquefaction necrosis of the exudation begins, which spreads by peripheral extension until a smaller or larger area of softened or fluid purulent material, surrounded by a more or less well defined zone of limitation, results. The softened material consists of leukocytes, red cells, necrotic and degenerated liver tissue, infection, etc. The abscesses are very commonly situated near or on the surface of the liver. The surface of the liver is, therefore, involved (perihepatitis), and extensive adhesions may bind to it the contiguous organs. In some cases (especially after operations) the abscess is on rather than in the liver (suprahepatic, infrahepatic).

When small, multiple, metastatic abscesses are present, the liver is usually enlarged, swollen, opaque, and shows evidence of parenchymatous degeneration, or cloudy swelling. On section the organ reveals numerous grayish or yellowish, softened spots surrounded by hyperemic zones; the spots vary considerably in size depending upon the stage of development of the condition. In some cases the numerous small abscesses, by peripheral extension, become confluent and form a large abscess which may involve a whole lobe or in some cases the entire liver. The purulent contents are usually thick, creamy, yellowish, or thinner and seropurulent, or stained with blood or bile; the surrounding liver tissue is in most cases stained a greenish-yellow tint. The pus often has an offensive odor especially when due to gastric or duodenal ulcers.

Symptoms.—The early manifestations are not very characteristic. Therefore, unless the condition is well established involving a large portion of the liver, or interfering severely with its function, it is apt to be overlooked.

In traumatic abscess, and abscesses due to spread of infection from adjacent organs, the patient usually shows pain in the region of the liver, especially when the animal is handled or moved about. Jaundice, due to compression of the biliary ducts, and enlargement of the liver can usually be determined by palpation; fluctuation may also be evident. In multiple abscess the diagnosis is difficult, as there are no characteristic symptoms. The temperature is variable, usually slightly elevated; chills may be present. Examination of the blood often reveals leukocytosis, which is not always present, especially in chronic, well encapsulated abscesses. The urine is concentrated, highly colored, specific gravity increased, with an abundant deposit of urates and uric acid. When there is much destruc-

tion of the liver tissue the amount of urea is diminished, and albumin is often present.

Spontaneous rupture of the abscesses often takes place, especially in those cases resulting from traumatism, causing serious symptoms to suddenly develop. As in most cases the rupture occurs into the peritoneal cavity, a generalized peritonitis follows which soon leads to death.

Diagnosis.—An accurate diagnosis is usually quite difficult. The most suggestive signs are progressive enlargement and tenderness of the liver, jaundice, chills and fever, leukocytosis, and the consideration of the etiological factors.

When an abscess is suspected an accurate diagnosis can be made with safety (especially in the dog) by making an explorative laparotomy.

Prognosis.—Abscesses of the liver even in the single suprahepatic form should always be considered unfavorable. The small multiple abscesses are almost always fatal, death occurring in one to two weeks.

Treatment.—The early indications in the treatment are surgical. Under general anesthesia and strict antiseptic precautions, an explorative laparotomy should be performed. The incision in the abdominal wall should be made large enough to admit of a careful and free examination of the liver. Should the abscess be suprahepatic, or single in the liver substance, that portion of the liver is carefully brought out through the incision. It is very important that the liver be carefully manipulated to prevent rupturing the abscess. Should the abscess be of large size, it is often advisable to aspirate most of the contents before it is manipulated to prevent rupture of the sac and also to facilitate its withdrawal through the abdominal incision. When the affected portion of the liver is withdrawn, it should be surrounded on either side with sterile gauze to prevent any of the pus entering the cavity while operating. A free incision is made directly over the full length of the abscess, the contents of the cavity thoroughly washed out with boric acid solution (2 per cent) and the abscess wall thoroughly curetted to remove all of the necrotic tissue and detritus. If necessary some of the tissue is removed with the scissors or knife to straighten the edges of the wound, and also to be sure to remove all of the necrotic tissue. The wound in the liver is sutured with a deep continuous suture. Should the hemorrhage interfere it should be controlled by ligating the larger vessels.

Should the abscess be suprahepatic or infrahepatic, the affected parts should be carefully withdrawn, the adhesions broken down and the entire wall of the abscess completely extirpated. All exposed portions should be thoroughly irrigated before returning to the abdominal cavity.

When multiple abscesses are found surgical treatment is rarely of value. The external wound is sutured as in gastrotomy. (See Gastrotomy.)

ATROPHY OF THE LIVER

Definition.—A term generally applied to a reduction in the size of the liver. In most conditions where there is a reduction in the size of the liver it is due to degenerative changes.

Etiology.—Atrophy of the liver occurs most commonly from the following:

(a) Pressure upon the liver, by tumors, enlargement of adjacent organs, passive congestion, amyloid disease, etc. These causes may produce a

true atrophic condition of the liver with subsequent replacement fibrosis, or atrophy and degeneration (fatty degeneration and necrosis) as in passive congestion and amyloid disease.

(b) From a stenosis or occlusion of the portal vein, general hepatitis, advanced passive congestion, etc., a general atrophy of the liver may develop.

(c) A reduction in the size of the liver, which is not a true atrophic condition, follows many degenerative processes such as poisoning by phosphorus, arsenic, mercury, chloroform, etc.

(d) Reduction in the size of the liver frequently occurs, to which the term atrophy is applicable, in inanition, cachexia, etc. In this case the liver participates in the general atrophic process.

Pathology.—The liver is smaller than normal, dark in color, dense, of increased specific gravity, and dry. These changes are the result of the increase in the connective tissue and the decrease in the parenchyma. On cut section the surface is dry, and the liver substance very dense and firm.

Symptoms.—The symptoms are not very characteristic. There will be noticed inanition, cachexia, etc. The patient shows digestive disturbances, and the feces are light colored. The liver is very small; owing to its location it is difficult to palpate.

Diagnosis.—An accurate diagnosis is in most cases impossible during the life of the animal. The etiological factors may assist somewhat in making a diagnosis.

Prognosis.—The prognosis should always be considered unfavorable, owing to the structural change which has taken place in the liver, and the difficulty of removing the causative factors.

Treatment.—Satisfactory treatment is hardly possible, although treatment for the removal of the cause would be indicated.

FATTY LIVER

Definition.—A term applied to the excessive amount of fat in the liver. It includes fatty infiltration, in which there is an excessive deposit of fat without the liver cells becoming much altered, and also fatty degeneration, in which the liver cells are converted into fat cells.

Etiology.—The causes are: (a) feeding of animal for a long period on fats and carbohydrates, without the proper amount of exercise. This tends to produce obesity (which is common in house dogs), of which fatty liver is a common symptom. The fatty deposit is probably due to the incomplete oxidation of the excessive amounts of food. (b) Anemia, and cachexia, occurring in the later stages of chronic diseases, carcinomatosis and sarcomatosis, general inanition, etc. These conditions result in an insufficient supply of blood, therefore incomplete oxidation. (c) Passive congestion of the liver due to valvular insufficiency of the heart. (d) Poisonings, such as phosphorus, arsenic, mercury, etc., which are very common in small animals. Ptomaines from meats will produce a similar effect. (e) Infections developing in the intestinal tract, as distemper, infectious diarrheas, etc., the toxins of which are carried to the liver through the portal vein. General infection, such as by pyogenic organisms, will produce the same effect on the liver.

It is quite evident that the majority of cases of fatty liver develop through a deficient oxidation.

Pathology.—The liver is enlarged, often twice the normal size, the specific gravity lessened, and the resistance reduced. It is pale yellow in color, or yellowish areas or streaks are seen on the surface. The surface is smooth, and the edges somewhat rounded. On cross-section it is usually pale, anemic, and fat globules which adhere to the knife are often noted. In cases of passive congestion the characteristic appearance of nutmeg liver is observed (dark center and light periphery of the lobules).

Symptoms.—The symptoms of fatty liver are very obscure, and not sufficient in most cases to make an accurate diagnosis *intra vitam*.

AMYLOID LIVER

Definition.—A degenerative process of the liver characterized by the conversion of the proteins of the tissues into a structureless, homogeneous substance called lardacein.

Etiology.—This condition results most commonly in animals from the absorption of the toxins of pyogenic organisms. It requires for its production a long time and a persistent and continuous infection. It is not a very common condition in animals, and usually accompanies a general amyloid degeneration of other organs.

Pathology.—The liver is enlarged, sometimes two or three times its normal size, and the edges are rounded or blunt. The color is grayish-brown, and on cut section shows white points. Microscopic examination reveals the amyloid degeneration.

Symptoms.—Difficult to recognize during the life of the animal, and is only of importance to the pathologist. Other degenerative conditions which have been observed on postmortem in small animals are only of importance to the student in pathology and will not be described here, as a diagnosis can only be made on postmortem.

CIRRHOSIS OF THE LIVER

Chronic Interstitial Hepatitis

Definition.—A chronic inflammation of the liver with an increase in the interstitial connective tissue.

Etiology.—The exact causes are not definitely known. Infection no doubt plays an important rôle, bacterial toxins from the intestinal tract being carried direct to the liver. It may be produced secondarily from other diseases of the liver, such as acute and chronic hepatitis, congestion, etc. Parasitic invasion has been known to produce it in certain districts.

Pathology.—In the early stages the organ is usually enlarged; in later stages often atrophic. The liver maintains its shape, the surface is smooth, or in some cases granular. The color varies somewhat from a light green to a dark olive-green, and the liver nodules are separated by connective tissue. The consistency of the liver is greatly increased, and when incised it cuts hard and grates under the knife, due to the excessive amount of connective tissue. The bile passages are usually found normal.

Symptoms.—The symptoms are those of a chronic condition, with which is associated a disturbance in the intestinal tract. Jaundice, which is usually mild, producing only a slight tinge of yellow in the mucous mem-

branes; bile in the urine, giving it a greenish color; nausea and vomiting are often observed in the dog. An enlargement of the liver can be readily detected by palpation. In the advanced stages of the disease there is often ascites, enlargement of the spleen, and eventually general cachexia.

Diagnosis.—In animals a diagnosis is very difficult. The condition is usually first noted on postmortem examination. An explorative laparotomy in the dog is recommendable.

Prognosis.—The prognosis is unfavorable owing to the changes which have developed in the structure of the liver.

Treatment.—*Dietetic.*—Small quantities of easily digested food (raw, lean meat, milk, etc.) should be given to sustain the condition of the animal.

Medical.—Salines (magnesium sulfate, dog 8. to 12.) are indicated to produce a laxative action.

Should ascites be present diuretics are indicated to assist in the removal of the fluid from the abdominal cavity.

Surgical.—Thoracentesis abdominis is indicated. (See Ascites.)

NEOPLASMS OF THE LIVER

Tumors of the liver are not very common, except secondary to malignant growths in other organs. These consist mainly of carcinomata and sarcomata, which have become generalized (carcinomatosis and sarcomatosis). Benign tumors are occasionally met with, *viz.*: adenomata and angiomata.

Symptoms.—Tumors of the liver are difficult to recognize during life, and only in those cases where they become very large, producing distention of the abdomen, will they be recognizable. Palpation, when done carefully, will often reveal the tumor which will be freely movable in the cavity. If the tumor is malignant (sarcoma and carcinoma) it will lead to symptoms of anemia and cachexia. An accurate diagnosis can only be made after laparotomy.

Treatment.—When malignant tumors are found, no treatment is of value. Benign tumors may be removed by carefully ligating all vessels, and preferably removing an entire lobe of the liver where affected. Hemorrhage is usually severe when the tissue of the liver is incised. Therefore operations on the liver are always considered serious.

CHOLELITHIASIS (GALL STONES)

Cholelithiasis is quite rare in animals. Only a few cases have been reported where free concretions were found in the biliary ducts and these occurred most commonly in the gall-bladder and ductus choledochus. Gall stones are the result of a catarrhal inflammation of the membrane of the duct or gall-bladder causing a desquamation of the epithelium and a collection of bile salts, gradually forming concretions. Infection or parasites gaining entrance *via* the duct and producing irritation are common causes.

Symptoms.—Gall stones may exist for some time without producing any marked symptoms, depending upon the location of the concretion. When in the gall-bladder but little disturbance will be produced, but when the concretion passes out into the ductus choledochus, severe colicky symptoms

are observed, and by completely blocking the exits of the bile, obstruction or hepatogenous icterus is produced. (See Icterus or Jaundice.) A diagnosis is difficult and, when suspected, an explorative laparotomy should be performed.

Treatment.—Surgical means should be employed early. Under general anesthesia laparotomy is performed, as for gastrotomy (see Gastrotomy) making the incision longer, if necessary. The portion of the liver containing the gall-bladder and duct is brought out through the incision. A careful examination should be made to determine the location of the concretion. When located, an incision is made down upon the concretion just large enough for its removal. Care should be taken to prevent the bile from running into the cavity. After all the concretions are removed the wound is stitched carefully with a fine suture using a small, straight needle. A continuous suture is first used to bring the edges of the wound in apposition, and then a Lembert suture to completely close the opening and bring the serous membranes together for rapid healing. The parts should be thoroughly cleansed before returning to the abdominal cavity. The laparotomy wound is sutured in the regular manner. (See Laparotomy.)

RUPTURE OF THE LIVER

Ruptura Hepatis—Apoplexia Hepatis

Etiology.—Owing to the structure of the liver being very friable and easily torn and its blood supply great, it is not uncommon that rupture of this organ takes place. The common causes are injuries, such as being run over by vehicles, penetrating rib fractures, severe exertion (running, jumping, falling, etc.), or during the course of infectious diseases when there is a severe congestion or inflammation of the liver. Predisposing factors are: degenerative processes in the liver, such as fatty liver, amyloid liver, etc., or diseases of the heart and vessels.

Pathology.—The postmortem lesions depend largely upon the extent of the rupture. Small hemorrhages are often found showing through the capsule of the liver, greater hemorrhages may occur in the form of a large hematoma. In most cases, however, the capsule also becomes torn and the blood is allowed to flow out into the abdominal cavity. The liver when examined will reveal the rupture. The other tissues and organs will be pale and anemic.

Symptoms.—Small hemorrhages in the liver will not produce any marked symptoms. If severe there will be all the symptoms of internal hemorrhage, such as paleness of the mucous membranes, general weakness, anxious expression, weak rapid pulse, and dyspnea; the extremities and skin become cold, trembling of muscles, and finally coma. Death often takes place very suddenly or within ten or twelve hours, depending upon the extent of the rupture. Small and continuous hemorrhages will be observed where the rupture is very small or where a hematoma is forming showing symptoms of weakness, paleness of the membranes and often some icteric symptoms. Such cases often recover in a few days or death may occur from exhaustion in four to ten days.

Diagnosis.—An accurate diagnosis is very difficult. The anamnesis may exist in arriving at a definite conclusion.

Prognosis.—Should be considered unfavorable as most cases, especially where the hemorrhage is severe, terminate fatally. Where slight hemorrhage takes place, the prognosis is more favorable, although if there is some disease of the liver present, fatal hemorrhage may recur at any time.

Treatment.—The treatment must be given as early as possible and is the same as for any internal hemorrhage.

Subcutaneous injections of ergotin (dog, 0.1 to 0.3) or adrenaline chloride (0.5 to 1. of a 1 to 1000 solution) are useful. These doses can be repeated in a half to one hour if necessary.

To stimulate the heart action strychnine sulfate (0.001) or caffeine citrate (0.1 to 0.3) should be given every few hours. Otherwise the treatment is symptomatic.

CHAPTER XIII

DISEASES OF THE PERITONEUM

General Remarks.—The peritoneum is a serous sac, and, considering all of its reflections and fossæ, it covers a surface very nearly as great as that of the skin. In the female it differs from other serous cavities in that it has an indirect external opening through the uterine tube; in the male there is no opening.

The peritoneum through the lymphatics and blood-vessels has great power of absorption as has been demonstrated on numerous occasions. The dog or rabbit will absorb fluid equal to 10 per cent of the body weight in one-half hour. Fluids and soluble substances are readily taken up and carried away by the blood, while insoluble substances, including microorganisms, are taken up by the lymphatics with the aid of the phagocytes. In health, the secretion of fluid into the peritoneal cavity and the absorption therefrom is just sufficient to keep the surfaces moist and free from infection. In disease this normal equilibrium becomes disturbed, and either produces a dry condition of the membrane, from absorption being greater than secretion (neutro inflammation), or secretion being in excess of absorption (ascites). The presence of the fluid in the peritoneal sac has a further action than preventing friction to the surface, and that is by exerting a bactericidal action.

The lymphatic absorption is carried forward by the lymphatic trunks to the mediastinal glands. Experiments have shown that microorganisms can be removed from the peritoneal sac *via* the lymph stream, and carried into the mediastinal glands in six minutes after their injection into the abdominal cavity. The peritoneum covering the diaphragm and the omentum is most active in this process of absorption, removing inert bodies and also microorganisms from the peritoneal cavity. The omentum is, further, an important factor in preventing peritonitis, in that it removes the microorganisms from the abdominal cavity before they can produce their pathogenic action. The omentum also has the great faculty of localizing inflammation and infection by attaching itself to any inflamed organ or possible source of infection. It becomes fixed around the margin of the inflammatory or infected area, where it adheres, preventing generalization. The omentum is an important protective mechanism after surgical work on the organs in the abdominal cavity. Another point worthy of mention is the fact that abscesses which develop following operations, puncture of abdominal walls, etc., usually open to the outside rather than in the abdominal cavity, due no doubt to the great defensive powers of the peritoneum as compared to the other tissues.

safety than in other animals. The cat is slightly less resistant than the dog. However, it must always be remembered that there is a great variation in the natural resistance of individuals of the same species depending to a great extent upon their physical condition, etc.

As a summary, the defensive powers of the peritoneum are of great importance and are: (a) its great absorbing power, removing organisms before they can multiply sufficiently, produce toxins, and excite inflammation. (b) The phagocytic action exerted by leukocytes, polymorphonuclear leukocytes and the endothelial cells. (c) The faculty of the omentum in walling off local infections and inflammations preventing diffuse peritonitis. (d) The antitoxic and bactericidal properties of the peritoneal fluid. This fluid is increased when necessary.

PERITONITIS

Definition.—An inflammation of the peritoneum. From the standpoints of intensity and duration peritonitis may be classified into: (a) acute, and (b) chronic.

Acute Peritonitis.—**Definition.**—An acute inflammation of the peritoneum. From a clinical standpoint acute peritonitis may be divided into: (a) circumscribed or localized, and (b) general or diffuse. Other divisions are hardly recognizable during the life of the animal. Even the most severe cases of peritoneal infection often show the least evidence of inflammatory reaction. The inflammatory reaction which takes place in peritonitis is often a salutary process, by preventing excessive absorption from the peritoneum, leading to the destruction of microorganisms that have gained entrance, and by the formation of fibrin and adhesions preventing the spread of infection to the entire serous membrane.

Etiology.—From the standpoint of cause acute peritonitis may be divided into: (a) primary, and (b) secondary.

(a) Primary, acute peritonitis is applied to those cases where there is no local focus in the abdomen to account for the infection of the peritoneum; it is assumed that the infection has reached the abdomen by the blood or lymph stream, or from some injury to the abdominal wall, such as blows, kicks, gunshot wounds through the abdominal walls, bowels, etc., or operations of various kinds on the organs in the abdominal cavity.

(b) Secondary, acute peritonitis is due to infection at some localized area in the abdomen, or in the immediate neighborhood, which develops rapidly producing a diffuse or circumscribed inflammation. This form of peritonitis is very common in animals and results from a number of conditions. It may be due to infection from the abdominal viscera, following perforation of their walls, or to inflammation and the infection passing through the walls. The following conditions are frequent causes: perforation of gastric or duodenal ulcer; acute toxic, gastro-enteritis; mycotic gastro-enteritis; traumatic rupture of the stomach or bowels; strangulation of the bowels, volvulus; intussusception; foreign bodies in the bowels; impaction of the bowels; rupture of abscesses in the liver, spleen, omentum, lymph glands, etc.; rupture of the bladder when inflamed; acute phlegmonous, or gangrenous cholecystitis; metritis and parametritis after parturition; injuries to the uterus during parturition; abscess of the prostate gland, etc. These conditions allow the free entrance of microorganisms, or reduce the resistance of the peritoneum so that organisms develop readily. Nu-

merous organisms are found producing peritonitis, such as staphylococci, diplococci, streptococci, *Bacillus bipolaris*, *Streptothrix canis*, *Bacillus pyogenes*, *Bacillus coli communis*. A fungoid peritonitis has also been observed in the dog produced by the *Sporotrichum beurmani*. Parasites, when severe invasions take place, will often produce peritonitis. Exposure to cold, and insanitary conditions are often predisposing causes, especially in dogs.

Pathogenesis.—As soon as the defensive powers of the peritoneum (the phagocytic action of the endothelial and other cells, the bactericidal power of the peritoneal fluid depending on the presence of antibodies, and absorption which destroy and remove organisms) are neutralized by any of the etiological factors mentioned, the membrane becoming dried and exposed during operations, etc., or the presence of solid bodies, particles of food, blood clots, etc., the resistance of the peritoneum is lowered and its absorbing and bactericidal power interfered with. This allows the organisms to develop, produce their toxins and an acute peritonitis.

Pathology.—According to the character of the exudation, peritonitis can be classified as fibrinous, serofibrinous, fibrinopurulent, suppurative and hemorrhagic. The character of the inflammation depends greatly on the nature of the infection. In cases of low virulence, such as are occasionally observed, the serous surfaces present little more than a slight loss of luster, with some slight deposits of delicate fibrin. In the ordinary form, in the early stages, there is marked congestion of the serous membrane, later the serous surface becomes dull, lusterless, and the contiguous surfaces become slightly adherent through the depositing of yellowish-white flakes of fibrin (peritonitis fibrinosa). In some instances there is but little effusion of fluid, but in most cases there is a copious effusion of exudation, somewhat turbid, containing flocculent masses of a yellowish color (peritonitis serofibrinosa). The quantity of fluid varies considerably from a few cubic centimeters to several liters. In other cases the exudation is more turbid and contains purulent material (peritonitis purulenta). The peritonitis following rupture of the bowel is very virulent, the exudation is purulent and contains bowel contents. In the abdominal cavity a quantity of dirty, brown, turbid fluid of offensive odor is found. In all cases of peritonitis with effusion more or less blood is always present (peritonitis hemorrhagica). When the peritonitis results from rupture of the bladder, urine will be present in the abdominal cavity, and the odor will be detected in the abdominal contents.

Symptoms.—Acute, diffuse peritonitis, when due to injuries, rupture of the bowels, abscesses, etc., usually develops rapidly under symptoms of marked general disturbance. In the most severe infections the symptoms are principally those of a septicemia or toxemia. In the beginning there is abdominal pain, restlessness, stiff unnatural gait, and "tucked up" abdomen. Palpation over the abdomen reveals intense contraction of the abdominal muscles, and considerable sensitiveness. When the peritonitis is diffuse the sensitiveness is noted over the entire abdomen; when circumscribed only local areas of tenderness are evinced. The pain is often severe enough in small patients (dog and cat) to cause them to groan and cry. Pain is a prominent symptom, and is usually continuous, except in cases where a general toxemia exists. The respirations are of the costal type. In most cases they are diminished, but if fluid is present there is severe dyspnea.

Vomiting is an early and characteristic symptom of peritonitis in the dog and cat. It is usually one of the first symptoms, and is very persistent. The vomitus consists mainly of mucus, food particles, bile, and, if severe, of fecal matter.

There is complete loss of appetite noted early in the course of the disease. The urine is decreased in quantity, highly colored, and contains a large amount of indican. There is often severe straining as if to urinate (*tenesmus vesicæ*).

In the early stages there is diarrhea followed later by constipation with considerable tympany. In the very early stages the temperature in the dog and cat is elevated (104° to 106° F.). The temperature, however, remains high for only a few hours when it drops rapidly and becomes subnormal (96° to 100° F.). In small animals the temperature in peritonitis is usually normal or subnormal.

The pulse is rapid, small, hard and often wiry. In the later stages the pulse becomes very weak, irregular, and finally imperceptible. The extremities grow cold, the mucous membranes cyanotic, and there is every evidence of a deficient heart action.

Effusion of fluid (*ascites*) is usually present except in some of the more acute cases which are rapidly fatal. The percussion sound is flat, the area of dulness shifting as the patient's position is changed. A friction sound may be present in the early stages, but due to the effusion which forms early, soon disappears.

In some cases of peritonitis, due to severe septic infection (rupture of abscesses), the course is very rapid and the general symptoms of toxemia are the only ones noticed. Peritonitis following rupture of the stomach or bowel, from severe injury, such as being run over, kicks, etc., runs a very rapid course. General weakness, coldness of the extremities, and coma may be the only symptoms noted.

The symptoms of circumscribed peritonitis are similar to those of diffuse, except that they are so mild at times as to be overlooked.

Course.—The acute, diffuse peritonitis usually terminates in death. The most intensive forms usually produce death in thirty-six to seventy-two hours; however, most commonly death results in five to eight days. Some of the milder cases terminate in recovery, or chronic peritonitis, which runs a long chronic course.

Diagnosis.—In typical cases the sudden onset, the sensitiveness over the abdominal region, the fever, the wiry pulse, the development of effusion, the collapse and the vomiting, present a rather characteristic picture. In some cases of rapid development the diagnosis is very difficult and is hard to differentiate from septicemia or toxemia.

In the latter stages of the disease, where deep coma is present, an accurate diagnosis is impossible. Often circumscribed, acute peritonitis is overlooked. A careful examination, therefore, is necessary to determine the exact condition.

Prognosis.—The prognosis is acute, diffuse peritonitis is unfavorable, especially if it follows rupture of the stomach, bowel or abdominal abscesses. Such cases invariably terminate in death. In circumscribed fibrinous or sero-fibrinous peritonitis the majority of cases make a complete recovery. Circumscribed peritonitis, however, due to local infection should be looked

upon as dangerous, as the abscess may rupture into the abdominal cavity eventually terminating in death from diffuse peritonitis.

Treatment.—Medical.—In the early stages, diarrhea is present and the peristalsis active. In order to prevent friction between the peritoneal surfaces, which tends to spread the inflammation, small doses of opium (dog, 0.1 to 0.3; cat, 0.05 to 0.1), or morphine sulfate (dog, 0.016 to 0.12) subcutaneously are indicated.

Cold applications, if applied early to the walls of the abdomen, are indicated (cold water compress or ice pack) to relieve the intense congestion of the serous membrane. Later counterirritants may be used in the form of oil of mustard mixed with olive oil (1 to 10). Apply by rubbing well into the skin of the abdomen. Hot water applications may also be used. Should constipation be marked laxatives should be given, such as castor oil (dog, 15. to 30.; cat, 5. to 8.) or magnesium sulfate (dog, 10. to 14.; cat, 2. to 5.). Warm water infusions into the rectum will be useful to remove feces and also to produce a soothing action on the membranes. General stimulants (strychnine sulfate, dog, 0.001; cat, one-half the quantity subcutaneously) are employed to combat symptoms of general weakness and coma. Alcoholic stimulants or camphor may also be used for the same purpose.

Surgical.—When severe infection is present, and in the early stages, it is advisable to irrigate the abdominal cavity in the following manner: laparotomy should be performed (see Laparotomy) and a sufficient amount of sterile, normal salt solution introduced at the body temperature to thoroughly irrigate all parts of the cavity. This should be followed by a boric acid (2 per cent) or a salicylic acid solution (2 per cent). The value of this method will depend largely upon the thoroughness of the application. Before irrigating a thorough examination of the organs and tissues in the cavity should be made for ruptures, etc., and if found, proper treatment should be applied. When an excessive amount of effusion is present it should be removed. (See Treatment for Ascites.)

Chronic Peritonitis.—Definition.—A chronic inflammation of the peritoneum which may be either diffuse or circumscribed. As a rule chronic peritonitis is rarely found equally well marked over the entire abdominal cavity. From a clinical standpoint it is difficult to separate the two conditions, therefore, they will be described as one.

Etiology.—Chronic peritonitis may be due to a number of different causes, the most important of which are: intra-abdominal lesions, such as diseases of the liver (hepatitis, abscesses), the kidneys, spleen, etc., which may reduce the resistance of the peritoneum; or from gastric or duodenal ulceration providing a focus for peritoneal infection. In these cases a general chronic peritonitis results instead of a local inflammation, owing to the reduced resistance of the membrane, or the low virulency of the infection. Chronic venous engorgement from defective heart action would produce much the same effect. Chronic peritonitis may result from the acute fibrinous form when complete resolution does not take place, or the infection is mild.

In some cases it may result from disease of the pleura by spreading through the diaphragm. Chronic peritonitis may also result from disturbances of the intestinal tract.

Ascites, when due to disease of the heart, may produce chronic peritonitis by lowering general resistance, or through organisms which gain entrance

during paracentesis abdominis. Parasites (*Linguatula rhinaria*, *Echinococcus granulosus*) in the dog and cat may cause chronic peritonitis by the constant irritation to the peritoneum they produce.

Pathology.—The postmortem lesions vary somewhat depending upon the causes, and the extent of the process. The peritoneum is covered by a thick membrane, which is dull white or glistening, pearl-like in color; pigmentation is sometimes present. In very severe cases of long standing this membrane becomes very thick, especially over the visceral peritoneum, and can be peeled off from the organs. Adhesions between the folds of the visceral peritoneum are often found, which may bind together several organs into one mass. The formation of this membrane is due mainly to an organization of the exudation and not to hyperplasia of the peritoneum itself.

Symptoms.—The symptoms are somewhat similar to ascites. The onset is gradual; usually no symptoms are noted until distention of the abdomen develops. There is no pain or tenderness on manipulation. On percussion a dull sound is emitted, and on auscultation, especially if the abdomen be tapped on the opposite side with a finger, the presence of fluid can be detected by the splashing sound produced.

There are usually general symptoms of dulness, and lack of energy, shown by the animal lying down a great deal and refusing to move about. The patient has, as a rule, a good appetite unless constipated. Respirations are increased owing to the pressure against the diaphragm.

The character of the fluid varies somewhat. It has a specific gravity of about 1015, is of a yellowish or turbid color, from the presence of large numbers of cells, and when allowed to stand it usually becomes thick and forms large amounts of flocculæ.

The temperature in the dog and cat remains normal or slightly subnormal. The pulse is often rapid and irregular.

Diagnosis.—The character of the fluid in the abdomen is one of the chief diagnostic symptoms, and some of it should be obtained and examined for its specific gravity, cells, etc. A careful examination of the animal must be made to distinguish this from ascites due to other causes. The anamnesis may also assist in making the diagnosis.

Prognosis.—The prognosis is unfavorable, the course chronic. Complete recovery is hardly to be expected, although a number of cases have been reported where apparent recoveries have taken place. Death is usually the result of heart failure.

Treatment.—The cause should be ascertained if possible, and the treatment given accordingly. If the cause cannot be determined, symptomatic treatment is given. Diuretics, such as caffeine citrate (0.1 to 0.3) or diuretin (0.15 to 0.4) are indicated to assist in removal of the fluid.

Paracentesis abdominis (see Ascites) should be performed whenever necessary to remove the fluid from the cavity. The dog, as a rule, responds more readily to treatment than the cat.

ASCITES

Hydrops Abdominis—Hydrops Ascites—Hydrops Peritonei

Definition.—A collection of serous fluid in the abdominal cavity. This condition is quite common in dogs and cats. Mild cases of ascites are often

overlooked during life, and are only found on postmortem or during operations on the abdominal cavity.

Etiology.—1. *Local Causes.*—(a) Chronic inflammation of the peritoneum, either simple, carcinomatous, sarcomatous, or by cysts of parasites. (b) Obstruction to the portal vein, either in its terminal branches in the liver, such as by cirrhosis, chronic, passive congestion, etc., or by compression of the vein in the gastro-hepatic omentum, such as by proliferative peritonitis, abscess, tumors (sarcomata, carcinomata, etc.), or by aneurysm. (c) Thrombosis of the portal vein. (d) Tumors in the abdominal cavity in general. (e) Cysts of the ovaries (common in cats). (f) Occurs in the secondary stage of acute circumscribed or diffuse peritonitis.

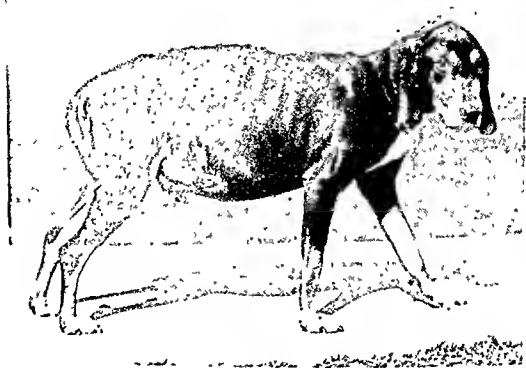


FIG. 12.—Ascites.

2. *General Causes.*—Ascites often occurs as a symptom of general dropsy, the result of mechanical effects, as in heart diseases, chronic indurative or interstitial pneumonia. In some heart diseases the effusion is confined to the abdominal cavity, in which case it is no doubt due to secondary changes in the liver. Ascites also occurs in chronic diseases of the liver. In young dogs (puppies) ascites is frequently observed, and often disappears as the animal develops, apparently without any particular cause being found.

Pathology.—The presence of fluid in the abdominal cavity, of varying quantity from a few cubic centimeters to 15 to 20 liters. This fluid has a specific gravity of 1012 to 1015, a light or yellowish color, clear, and contains, as a rule, but a slight amount of fibrin, or flocculent precipitate. The chemical reaction of the fluid is alkaline or neutral; the albumin content is about 2 to 5 per cent. Sometimes the fluid will be of a reddish color, due to slight hemorrhages, or to some of the red cells passing out with the serum. This is especially noticeable in obstruction to the portal vein. A greenish cast is noticed when the liver is secondarily affected. The precipitate when examined will be found to contain a small number of leuko-

cytes, fatty endothelial cells, flakes of fibrin, and sometimes red cells, and in rare cases numbers of small cysts of parasites. In dogs and cats the fluid often contains numerous fat cells and has a milky appearance.

The peritoneum is usually pale, glistening, thickened, especially in cases of long standing or those due to chronic peritonitis. The organs in the cavity are usually anemic, dull on the surface and sometimes atrophic.

Symptoms.—An enlargement of the abdomen is usually the first indication of the disorder. Until the accumulation of fluid becomes great enough to cause a distention of the abdomen, the symptoms will not be positive enough to make a diagnosis. As the amount of fluid in the abdomen varies greatly, the symptoms will vary considerably in individual cases. The fluid distends the abdominal wall, causing the muscles and skin to become tense, and the abdomen to assume a characteristic pear shape. When the animal assumes a standing posture, the fluid collects in the lower portion of the abdomen and the amount can be rather accurately determined by percussion. Above the line of dulness will be noticed a tympanitic sound. Changing the position of the animal causes a shifting of the horizontal line which marks the upper limits of the area of dulness.

On palpation the resistance is fairly uniform. By placing one hand on the side of the abdomen, and tapping gently on the other side with the other hand, a plain undulation will be felt. As the amount of fluid increases, pressure is produced on the diaphragm, interfering with the function of the organs in the thoracic cavity. Severe dyspnea with cyanotic membranes is noted in some cases. The pulse is weak and rapid. As the cases progress, emaciation appears. The appetite is impaired, the digestive tract disturbed and occasional attacks of vomiting occur. The temperature is normal; in the later stages it may be subnormal. The urine is reduced in amount, and often highly colored in the dog; otherwise it is normal. The animal may die from general exhaustion, or from asphyxia.

Diagnosis.—The diagnosis is not difficult, provided a careful examination is made of the patient, its history obtained, and all the symptoms carefully noted. However, there are quite a number of conditions with which ascites might be confused. It might be mistaken for acute or chronic peritonitis with effusion. By puncturing the abdominal wall with an explorative trocar and obtaining some of the fluid, a differential diagnosis can be made.

Treatment.—Medical.—The cause should first be determined, if possible, and measures taken to eliminate it. Should the heart action be deficient, digitalis would be indicated (dog, 0.05 to 0.10; cat, one-half the quantity) to stimulate the heart and overcome venous stasis. This drug is further of great value owing to its diuretic action, which assists in the elimination of fluid from the body. Caffeine citrate (dog, 0.1 to 0.5; cat, 0.05 to 0.1) has a similar action. The resorption of the exudate may also be aided by the use of diuretics: potassium acetate (dog, 0.5 to 0.8; cat, 0.05 to 0.1); bulbous scillæ in powder form (dog, 0.05 to 0.2; cat, 0.01 to 0.05); diuretin (dog, 0.5 to 1.; cat, 0.01 to 0.05) every two or three hours, or agurin (dog, 1. to 2.; cat, 0.02 to 0.08) daily. Laxatives should be administered occasionally to keep the bowels open which also assist in removing the fluid. Magnesium sulfate (dog, 8. to 14.; cat, 1. to 4.) is best for this purpose. Diaphoretics may also be administered, although not so important in small animals as in large ones, as the skin glands are less developed. Pilocarpine hydrochlorate (dog, 0.005 to 0.01) can be used, but there is some danger of edema of the lungs or paralysis of the heart from its use.

Surgical.—If the fluid produces severe dyspnea and interferes with the action and function of abdominal and thoracic organs, it should be removed surgically by performing paracentesis abdominis. The operation is as follows: the animal is placed in a standing position, or on its side on the operating table and the hair shaved from a small area at the most pendent portion of the abdomen, usually near the umbilicus. The surface should be rendered aseptic by washing with bichloride soap, followed by alcohol, and tincture of iodine painted over the surface where the puncture is to be made. A small exploring trocar is used, which should be sterilized, and inserted through the abdominal walls first going through and under the skin for about $\frac{1}{2}$ inch before puncturing the muscular coats. When the stylet is withdrawn, the fluid will usually flow out in a stream. Sometimes the end of the cannula becomes blocked by omentum or bowel. This can be overcome by moving the cannula slightly or by re-inserting the stylet. The fluid should be collected in a vessel to note its character. The amount of fluid to remove depends largely upon the condition of the animal. Should, however, symptoms of dyspnea, cyanosis, and rapid, weak pulse appear, the cannula should be at once removed. The operation may be repeated next day. The puncture wound resulting from the operation should be protected by covering with collodion and a small pledget of cotton. Death occurs occasionally from collapse following the operation. Therefore the patient should be carefully watched and the removal of the fluid stopped, and general stimulants given, when signs of collapse appear.

PART IV

DISEASES OF THE REPRODUCTIVE ORGANS

CHAPTER I

DISEASES OF THE PENIS AND PREPUCE

Examination.—The prepuce should be examined by observing the discharge at its opening, and the condition of the mucous membrane. Frequently there will be found a more or less extensive mucopurulent discharge which indicates a catarrhal inflammation of the prepuce. The preputial opening should be dilated and the mucosa examined for wounds, foreign bodies, tumors, ulcerations, secretions, etc.

The penis may be examined in the following manner: the animal should be placed in the dorsal position, and either held by assistants, or securely fastened to the table with hobbles. With the left hand, the prepuce is gently pushed downward and backward, exposing the free end of the penis. The penis is then grasped with the fingers of the other hand and pulled as far out of the prepuce as possible. A piece of tape should be placed around the penis just posterior to the glans, and with gentle traction the penis can be exposed for a considerable distance. The penis should be examined for inflammations, tumors, venereal granulomata, rubber bands, wounds, fractures of the os penis, etc.

Prognosis.—Favorable in most cases, as wounds in this location respond to treatment readily. Not so favorable in cases of strangulation of the penis with subsequent necrosis.

Treatment.—The parts must be thoroughly cleansed, washed with an antiseptic solution, and the character of the injury determined. Wounds in the prepuce, such as cuts or perforations, are sutured after thorough disinfection and all ragged edges removed with the scissors. Injuries to the penis should be looked after carefully, as they sometimes lead to sufficient swelling to interfere with the discharge of urine. In such cases, the catheter is introduced and the urine withdrawn. Should this procedure fail, make an opening in the urethra at the ischial arch to temporarily take care of the discharge of urine. Applications of antiseptic solutions for a few days will reduce the inflammation and infection. When the penis is strangulated and necrotic, it is advisable to amputate the affected portion. This is done in the following manner: the animal is anesthetized, placed on the table in a dorsal position and securely hopped. The parts should be thoroughly cleansed with soap and water and disinfected. Pull the penis out of the prepuce as far as possible, and apply a rubber tourniquet at a point above the seat of operation to control the hemorrhage. Incise the penis with a scalpel, and if it is necessary to amputate through the os penis a saw should be used for this portion. The urethra is protected by a catheter previously inserted, and left about $\frac{1}{2}$ inch longer than the stump of the penis. It is split with the scissors on its dorsal surface back to where the penis was incised. The flaps of the urethra are then securely stitched to the stump of the penis to prevent a stricture forming at this point. All vessels should be ligated, and the parts again washed with an antiseptic solution. The tourniquet is removed and the penis allowed to retract back into the prepuce. Cleanse daily with antiseptics.

CONGENITAL MALFORMATIONS

Malformations of these structures are not common. Arrested development of the penis or prepuce is seen occasionally. Hermaphrodites are not common among dogs. Congenital closure of the prepuce is observed sometimes in puppies, which must be opened with a scalpel and the edges of the skin stitched back to prevent adhesions.

ARRESTED DEVELOPMENT OF THE PENIS AND PREPUCE

While this condition is not common it lends itself so readily to treatment that a brief description may be justified. It has been observed most frequently in Boston Terriers, which may be explained by the fact that considerable inbreeding has occurred in the development of this breed. Strange as it may seem the condition may go unnoticed until the animal reaches maturity.

Symptoms.—Such an abnormality usually involves the entire prepuce. At the point where the preputial orifice would normally be found, there appears a transverse fold of skin. From either end of this fold and extending backward on either side and parallel to the median line, there exists a slight elevation or ridge. Such elevations terminate just anterior to the scrotum and form the boundary between the normal skin and the area occupied by the prepuce in normal animals. The area between these lines

or folds has the appearance of mucous membrane except that it is dry and shiny. It is usually non-pigmented.

The penis is rudimentary, being 1 to 1½ inches in length. It is located just anterior to the scrotum and usually is curved slightly downward. A modified os penis is always present. The urethral opening is seldom located on the anterior extremity of the penis although this may appear to be the case. While this opening may be found somewhere in the dorsal surface (epispadias) it is most commonly present on the ventral surface (hypospadias) and near the junction of the skin and mucous membrane. In a few instances the opening of the urethra has been observed at the anterior extremity of the area between the testicles.

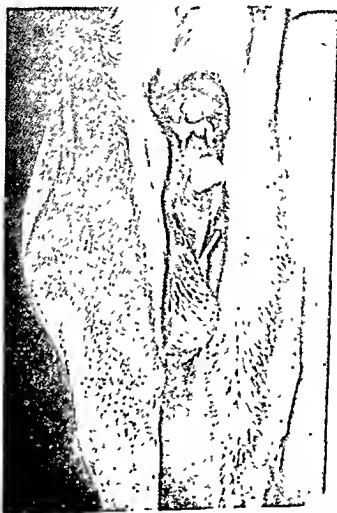


FIG. 13.—Arrested development of the penis and prepuce. Light line indicates location of urethral opening.

tated being careful not to damage the urethra. The cut edges of the skin should now be brought together and sutured. This will cover the area from which the mucous membrane like tissue has been removed. If this procedure is followed all parts will be covered with hair except the urethral opening and in some cases that part of the penis in which it is located. Castration is advisable. The operative area should be protected by appropriate dressings.

Care must be taken to preserve all the skin possible in making the primary incision which will prevent too much traction on the sutures and result in more satisfactory healing.

PREPUTIAL CATARRH

Balanitis

Definition.—A catarrhal inflammation of the mucous membrane of the prepuce.

Etiology.—Preputial catarrh may be produced by several different factors:

- (a) Principally local infection.
- (b) Develops in a number of cases secondary to other diseases; venous stasis; phimosis; paraphimosis; injuries, or foreign bodies.
- (c) Sequel to specific infectious diseases, as dystemper.
- (d) Follows in some cases of mange and eczema.

In all of the above causes we find that the condition is brought about by infection either as a primary cause, or due to reduced resistance of the tissues by other diseases which allows secondary infection to take place. In some, accumulations of dirt will favor injury to the mucosa with subsequent infection.

Symptoms.—The mucosa of the prepuce will be injected, swollen, and there is present at the preputial opening a discharge of pus of a yellowish or greenish color. Some of the material accumulates around the preputial opening agglutinating the hair, drying and forming crusts. Examination of the mucosa shows a marked catarrhal inflammation.

Prognosis.—The condition is not serious as in most cases it remains local. When treatment is applied, recovery takes place after a few weeks.

Treatment.—The parts are thoroughly cleansed and all long hairs removed with the scissors. The prepuce should be washed thoroughly once or twice daily with antiseptic and astringent solutions (alum, 2 per cent; silver nitrate, 0.25 per cent; zinc sulfate, 1 per cent).

Symptoms.—In puppies it will be noticed that urine cannot be discharged; there may be frequent attempts at micturition, with only a small quantity passed or there may be complete suppression. In mature animals the same symptoms of difficulty in passing urine is often present. There is a narrowing of the preputial opening; sometimes it is exceedingly small. Animals suffering from phimosis are unable to copulate.

Treatment.—In phimosis surgical relief should be given promptly. There are two methods employed:

(a) The patient is placed in a dorsal position on the table and the parts disinfected. A longitudinal incision of sufficient length is made on the inferior portion of the prepuce to allow the penis to protrude. The two portions are temporarily stitched back to the skin to prevent adhesions and a recurrence of the condition. The wound should be treated daily with antiseptics.

(b) The animal is placed in the same position as above and local or general anesthesia given. A circular incision is made completely around the prepuce, removing about $\frac{1}{4}$ to $\frac{1}{2}$ inch of its end. The hemorrhage is usually slight. The mucosa should be stitched to the skin for the entire distance around the prepuce. This will insure a preputial opening of sufficient size. Care must be taken in this operation not to remove too much of the prepuce, as it would allow prolapsus of the penis. After-treatment consists in cleaning and disinfecting the parts daily.

cent), or by applying tape tightly around the glans. After the congestion has been reduced, manipulation as above will often reduce the condition. These manipulations will not suffice in cases which have become greatly swollen or edematous. It is then necessary to resort to an operation, which consists in simply splitting the prepuce longitudinally on its lower surface, making a slit of a sufficient length to relieve the strangulation and allow the penis to retract. Where gangrenous conditions have developed, amputation of the penis must be resorted to. After-treatment in these cases consists in applying antiseptic solutions freely.

TUMORS OF THE PENIS AND PREPUCE

Various forms of tumors, both benign and malignant, are found in this location. The following varieties are most common:

Papillomata.—These in most cases involve the prepuce. They are small, benign growths, appearing usually as predunculated warts. Sometimes they are found in large numbers with irregular or cauliflower-like surfaces and are usually found at the juncture of the skin and mucous membrane.

Symptoms.—They produce, as a rule, no marked symptoms of any kind, except in some cases a catarrhal inflammation of the prepuce (balanitis).

Treatment.—Tumors should be removed with scissors as close to the base as possible. Cauterize the base with silver nitrate. A recurrence is unusual.

Sarcomata, Epitheliomata and Carcinomata.—These are occasionally found involving the prepuce and penis. These tumors are malignant and show much the same characteristics from a clinical standpoint.

Symptoms.—In most cases these tumors involve the prepuce. They are characterized by their sudden development, irregular outline, degenerative changes, and tendency to spread into the adjacent tissues. They usually present a raw, ulcerating surface, show a tendency to bleed, etc.

Diagnosis.—The diagnosis depends upon the characteristic growth, and the microscopic findings.

Treatment.—In case a diagnosis of malignant tumor is positively made, the results of treatment are only temporary. Removal of the tumor is advised, and the incised portion should contain not only all of the malignant growth but also include a small portion of adjacent normal tissue. Malignant tumors are liable to recur in a short time.

Venereal Granulomata.—This is a form of tumor formation

or dark red in color, and on its surface presents a number of vegetative growths. These growths may be found also on the prepuce. They are characterized by their soft friable condition, tendency to bleed at the least touch; they may be sessile or pedunculated. The growths first appear in the form of small vesicles, which soon develop into pimples at first of a firm consistency, but as they grow become softer and more friable. Their growth is slow. In six months to one year they can involve most of the prepuce and penis. Examination of the inguinal lymph glands often reveals enlargement and secondary changes.

Diagnosis.—This must be based mainly on the infectious character of the growth (its spread by coition), and its characteristic development.

Prognosis.—The tendency to reappear after removal and the spread to other animals make the prognosis unfavorable. Often when the growths are removed from one area they reappear on another.

Treatment.—Complete removal of the growths surgically is recommended when possible. On account of the tendency to recur, they should be completely dissected out, even including some of the normal mucosa. It is advisable to cauterize the surface after their removal, and to treat the wounds with antiseptics. In all cases the patient must be closely observed and at the first sign of recurrence of the growths promptly operated. In advanced cases, with extensive involvement of both the penis and prepuce, and where general symptoms of emaciation and weakness are present, the penis should be amputated even including a portion of the prepuce. Roentgen-ray may be used.

CHAPTER II

DISEASES OF THE TESTES AND SCROTUM

WOUNDS AND INJURIES OF THE TESTES AND SCROTUM

IN the dog and cat wounds and injuries of these organs are of frequent occurrence, partly accidental and partly intentional. Attempts at castration with the escape of the animal before completion of the operation is a common condition. There will be incised wounds of the scrotum and in some cases even exposure of the testes. Bites from other animals, such as dogs, cats, and rats, produce a variety of wounds and injuries to the testes. Being run over by vehicles is a common source of injury to these organs.

Symptoms.—Hemorrhage from the scrotum will be noted in the case of wounds, which should always be examined carefully to determine the extent of the injury. Contused wounds or bruises are always characterized by swelling, stiffness, straddling gait, and pain on manipulating the testes.

Prognosis.—Wounds in this location are not as a rule unfavorable, although, if extensive, castration of the animal may be necessary. Slight wounds heal rapidly.

Treatment.—Small, incised wounds of the scrotum should be cleansed thoroughly with antiseptics, at least once daily. If the wound is recent it should be cleansed, the hemorrhage controlled, and sutured. Cover the sutures with an impervious dressing like flexible collodion.

In case the testicles are exposed, they should be removed. (See Castration). Contusions must be treated as in orchitis.

ORCHITIS

Definition.—An inflammation of one or both testicles.

Etiology.—Orchitis occurs in the dog and cat from bruises, or bites of other animals. Being run over by vehicles is a cause. Orchitis may be a sequel to wound infection, to distemper in the dog and cat, and the spread of infection from adjacent organs and tissues.

Symptoms.—The first symptoms noticed are those of enlargement of one or both testes; pain on manipulation of the organs; and a stiff, straddling gait. We should not mistake thickening of the scrotum, a common condition in old dogs, for orchitis. If due to infection there will be more or less elevation of temperature, and other symptoms of the primary condition. The local temperature is also increased.

Prognosis.—In orchitis from injuries, most cases terminate favorably. In the infective form the gland may be destroyed, or becomes chronic and the patient impotent.

In subacute or chronic cases of orchitis, hot packs are indicated, best in the form of hot water, applied in the same manner as above. Massaging with a small amount of antiseptic ointment is recommended, following the hot packs. In the infective form hot packs should be used with hot water to which has been added some antiseptic. Abscesses must be opened and treated with antiseptics. Should they involve the testicle it is best to remove them. (See Castration.)

in cases where the organs are normal, but to correct vicious habits (onanism) or a disposition to wander away from home.

Castration of the Dog.—The operation can be performed at almost any age, but is less dangerous before the dog reaches maturity. Between the ages of three to ten months the operation is safest as it causes less constitutional disturbance during the early period of the animal's life. The disposition of the animal is changed less, and there is not the tendency to obesity when castration is performed at an early age. However, when pathological conditions, onanism, etc., exist the operation may be performed at any time.

When the testicles are found in the scrotum, the operation is as follows: the animal is anesthetized by using morphine 0.06 to 0.2 subcutaneously, or ether inhalation. Place the patient in a dorsal position, with head lowered, and hind limbs spread apart on the table. This exposes the testicles and makes them easy of access. The scrotum should be cleansed and shaved, followed by liberal use of antiseptics. The use of a sterile shroud of sufficient size to cover the ventral surface of the posterior third of the animal's body is recommended. This may be securely held in place by forceps after drawing the edges around the lumbar region, thighs and tail. A hole is made in the shroud only large enough to allow the scrotum to be forced through. The testicles are grasped between the thumb and index finger of the left hand and gentle pressure used to make the scrotum tense. With a scalpel or castrating knife in the right hand, an incision is made parallel to the long axis of the testicle, cutting through all the structures to the visceral layer of the peritoneum. The testicle is grasped with the right hand which exposes to view the epididymis and visceral layer. There are several methods used to remove the testicles. The cord may be ligated above the epididymis and around the visceral layer by using a sterile, catgut ligature. This is a safe method, as it removes the possibility of hemorrhage, provided the ligature is securely applied. The other testicle is removed in the same manner. The emasculator also gives excellent results. The instrument should be allowed to remain in position for a few moments after the cord is severed. Occasionally hemorrhage will follow the emasculator, but is usually not serious. If severe, the vessels should be ligated. After the testicles are removed the wound in the scrotum may be left open, or sutures put in to prevent the entrance of foreign material. The incisions in the scrotum should be carried forward sufficiently to afford thorough drainage. The scrotum should be kept clean for a few days, and the wound washed with antiseptics. When done aseptically, the wounds sutured, and a dry sterile pack applied healing may be expected in a very short time. It is well to observe the animal, note the temperature and pulse for a few days, and if the temperature is found elevated, examine the scrotal wound for retention of pus and secretions.

Castration of the Monorchid and Cryptorchid Dog.—In monorchids one testicle is removed the same as in ordinary castration. The retained testicle in the abdominal cavity must be removed by making an incision through the abdominal wall about 2 to 4 inches anterior to the pubis, and to one side of the penis (note the side of retention!). The incision is made large enough to admit the index finger freely. The cord is then searched for in the sublumbar region, and when found, withdrawn through the opening, the testicle following. The cord may be ligated or the operation

performed with the emasculator. The abdominal wound is approximated with two or three interrupted sutures. An antiseptic pack and bandage should be applied to protect the wound and changed daily until healing takes place. The bandage is applied so that it does not interfere with micturition. Cryptorchids are operated in the same manner; both testicles may be removed through one opening, or two abdominal incisions made if found necessary. The patient should be properly prepared by dieting and administering a laxative twenty-four hours before the operation.

Castration of the Cat.—The same rules in regard to age, etc., apply as in the dog. Castration of the cat is best performed under complete anesthesia. The animal is placed on the table in the dorsal position, well hopped and stretched out so that it cannot squirm loose. Ether is administered until complete anesthesia is established. The hair is closely clipped with scissors, and the scrotum painted with tincture of iodine. A sterile shroud is now applied as in castration of the dog.

The testicles are grasped between the thumb and index finger of the left hand, and with the other hand a scalpel is used to make the scrotal incision. Two methods of removal are used:

The first method is to make the incision down to the testicle exposing it, pulling it out of the scrotal sac, and removing it with the emasculator or by ligation. Care should be taken in this method to pull the testicle up far enough to include the epididymis and visceral layer. The other testicle may be removed in a similar manner.

The second method is to perform the "covered" operation. This is done in much the same manner as the other operation, except that the incision is made down to the parietal layer which is not incised but drawn out with the testicle. The cord, including the parietal layer, is then ligated above the epididymis, and the testicle and its enveloping tunic removed. Hemorrhage and infection are not so liable to follow this method.

CHAPTER III

DISEASES OF THE PROSTATE GLAND

Examination.—In the dog this gland is best examined by digital palpation. The gloved finger is inserted in the rectum and if any enlargements are present they can be distinctly felt by pressing in a downward direction; if acute inflammation is present the slightest pressure will produce severe pain.

PROSTATITIS

Definition.—An acute or chronic inflammation of the prostate gland. In the dog this disease is nearly always found to be of a subacute or chronic type. Acute prostatitis is very rare in these animals.

Etiology.—Prostatitis is produced by microbe invasion, either *via* the urinary tract, the blood or lymph streams. It may occur from the spread of the inflammation from other parts of the urinary tract.

Symptoms.—Prostatitis usually develops gradually. The early symptoms are painful defecation and micturition. The animal will make frequent attempts at urinating, the urine voided in small quantities, or there may be complete suppression. Defecation is painful; sometimes impossible. The bladder is found distended. The passage of the catheter is often difficult due to the pressure of the enlarged glands upon the urethra. Gentle pressure on the catheter will cause pain, but in most cases it will gradually pass through the constricted portion into the bladder. The urine will then flow out.

Digital examination with the gloved index finger inserted in the rectum will reveal the enlarged glands. Should pus be present in the glands they will be somewhat soft and fluctuating.

The abscesses sometimes rupture, either into the urethra, the abdominal cavity or through the skin in the perineal region.

More or less irregularity in the temperature is noted.

Prognosis.—Although complete recovery cannot be hoped for, owing to the changes which have taken place in the glands, partial recovery is possible.

contents out. Prostatic abscesses are sometimes found with an opening out through the perineum. The opening should be enlarged sufficiently to afford good drainage, and syringed out with an antiseptic solution. Rupture of the abscess into the peritoneal cavity results in peritonitis, and death in a short time.

TUMORS OF THE PROSTATE GLAND

Hypertrophy of the Prostate Gland

Hypertrophy is common in old dogs, and is occasionally observed in young animals. In hypertrophy the normal glandular tissue is gradually replaced by fibrous connective tissue, which leads to an atrophy of the tubules and muscle fibers greatly increasing in the stroma of the gland. The gland gradually loses its function of secretion, becomes much larger, and firmer than normal. In the dog the prostate gland lies at the neck of the bladder, almost surrounding the urethra, and when hypertrophied it causes compression of the urethra making the passage of urine difficult.

Symptoms.—The most pronounced symptom of hypertrophy of the prostate gland is: obstruction to the passage of urine. The animal makes frequent attempts to urinate but either only a small quantity or none at all is passed. The straining induced may cause hematuria. The hemorrhage results from the pressure on the venous plexus of the gland exerted by the hypertrophic tissue. The bladder will be found distended and the animal showing considerable distress. There is always danger of rupture of the bladder from overdistention. A complication of conditions is often found in these cases of long standing, such as hydronephrosis, cystitis, etc. Constipation is practically a constant symptom owing to the interference with defecation. No febrile symptoms are observed in hypertrophy of the gland. Passing the catheter will reveal the urethral obstruction. This may be so pronounced that it will be impossible to get the catheter beyond the prostate. It is possible to palpate the enlarged gland by inserting the finger in the rectum, or in very thin subjects the gland may be felt through the abdominal walls.

Diagnosis.—The diagnosis is made by observing the symptoms, passing the catheter, and digital palpation. We must differentiate hypertrophy from abscess and inflammation of the gland. The difference in the temperature, the age of the animal, the size and consistency of the gland, and the chronicity of the process are indicative.

Prognosis.—The prognosis is unfavorable.

Treatment.—The bladder should be examined, and if found distended, emptied either by passing the catheter or by the use of the trocar.

Laxatives should be given (see Inflammation of the Prostate Gland). Internal administration of potassium iodide (0.1 to 0.2) daily has been used with success in some cases. At the same time injections of Lugol's solution directly into the gland may be employed. This is done with a small calibered, hypodermic needle, which is inserted into the gland, either through the rectum or perineal region, the syringe attached and the injection made. Two to 4 cc. of the solution are sufficient.

Since hypertrophy may be due to some endocrine disturbance, good results may be obtained by the oral administration of a synthetic estrogen

diethylstilbestrol. The dose is 1 to 2 mg. given daily for five to seven days. Later the dose may be decreased depending upon the results obtained.

Castration is distinctly remedial as it is followed by a reduction in the size of the gland. Obviously it cannot be employed in stud dogs. (See Castration.) Experimentally it has been proved that in a short time following castration the gland begins to atrophy. The activity and function of this gland depends to a large extent upon the function of the testicles.

Sarcomata and carcinomata have been found in this gland, but are not common. When found, no treatment can be given.

CHAPTER IV

DISEASES OF THE OVARIES

Examination.—Several methods of examination are used to detect abnormal and pathological conditions of the ovaries.

(a) By abdominal palpation. This method has not proved very satisfactory on account of the small size of the ovaries, and the amount of tissue necessary to palpate through. In emaciated subjects or when glands are enlarged, palpation is useful. In cats with large ovarian cysts, the cysts may be felt through the abdominal walls. For abdominal palpation the animal is placed in a standing position. The manipulator should stand either immediately in front of or in the rear of the animal with one hand on either side of the abdomen; the ovaries may be felt in the sublumbar region. This method is of value in a general way, but for accurate diagnosis it does not suffice.

(b) By observing the animal to note any symptoms of excitement, etc. Cats with ovarian cysts will often show evidences of nervous excitement, epileptiform convulsions, etc.

(c) Direct inspection of the ovaries can be made with but very little danger. Therefore in doubtful cases laparotomy should be performed and the ovaries examined for inflammation, tumors, cysts, etc.

INFLAMMATION OF THE OVARIES

Oophoritis

Definition.—An acute or chronic inflammation of one or both ovaries. Oöphoritis is not observed very often in animals. It should not be mistaken for the normal hyperemia of the glands during the estral period. However, acute and chronic inflammations are found involving these glands.

Etiology.—Results from injuries, such as being run over by vehicles. The compression of the organs may be sufficient to crush them, or it may lead to inflammations.

Extension of the inflammation from adjacent organs and tissues, as from the uterus and uterine tubes.

Infection of the ovaries may take place in some of the infectious diseases (distemper in the dog and cat), or it may be due to some non-specific infection carried to the ovaries by the circulatory system.

Symptoms.—In dogs oöphoritis may not be noticed. The patient will show stiffness in walking and pain on palpation over the glands. In cases where infection has taken place in the glands, abscesses may develop, and febrile symptoms be present. In subacute or chronic inflammations no marked symptoms will be observed beyond an enlargement of the glands. In cats epileptiform convulsions may result.

Diagnosis.—In the mild forms an accurate diagnosis is difficult without making an explorative laparotomy. In cats it should be differentiated from ovarian cysts. A careful examination must be made in all cases.

Prognosis.—Favorable, except when produced by infection. In the chronic form sterility is a common sequel.

Treatment.—Not much treatment is needed. In the severe forms, or when abscesses are present, it is advisable to remove the ovaries (oöphorectomy).

TUMORS OF THE OVARIES

Cysts.—Cystic formation in the ovaries is of very frequent occurrence, and perhaps much more common in cats than in any of the other animals. They consist in most instances of unruptured Graafian follicles, and are found either single or multiple. Unless they are of considerable size they do not produce any marked symptoms. In fact, where they are frequently found as multiple cysts, and when degeneration of the ovary has taken place, marked nervous symptoms will be noted. These are excitement, prolonged estrum, and in some instances epileptiform convulsions.

Diagnosis.—The diagnosis is difficult in most cases. Unless the cysts are of large size, and the nervous symptoms marked, the condition is usually not suspected. Laparotomy should be performed and the ovaries inspected to make the diagnosis positive. The cysts appear as enlargements projecting from the ovary. Their consistency is fluctuating; their contents transparent.

Prognosis.—The prognosis is unfavorable so far as relieving the condition and preserving the ovary are concerned. The symptoms can be relieved by removal of the glands.

Treatment.—The treatment is surgical and consists of the removal of the diseased gland. (See Ovariectomy.)

Other tumor formations in the ovaries are uncommon. Dermoid cysts have been found in a few instances. Adenoma and adenocarcinoma occur as secondary growths. When found the entire gland or glands should be extirpated.

OÖPHORECTOMY—OVARIECTOMY

Oöphorectomy is extensively practised to correct certain pathological conditions which are found in the ovaries; to suppress the sexual desire; prevent the female from becoming pregnant; to make more desirable house dogs and pets as they are more contented and peaceful. Cats, when operated during the first few months of their life, become much larger, and are much more desirable animals to have about the house.

All female animals should be operated if possible before the advent of the first estrual period, as it has been proved by experience that some females will continue to show sexual desire following complete removal of the glands. Such cases are observed in older females, especially those that have given birth to young, and those that have estruated normally for some time. However, we must take into consideration that in a number of cases where estruation follows removal of the glands, it is due to the fact that a small portion of the ovarian tissue has been left in, which develops and frequently becomes cystic.

The effect of this operation on females is worthy of note. Young animals operated before the periods of estrum are present, show no appreciable change in their development. They are active, develop regularly, and

in every way make very desirable animals. The most marked change occurs when older animals are operated. They often become fat, lazy, and inactive. Certain breeds of animals show these changed characteristics more than others. For this reason the operation should be performed before the animal reaches sexual maturity.

Oöphorectomy in the Dog.—This is one of the most frequent operations performed on dogs. It is a safe operation provided the following precautions are taken into consideration: (a) the operation should be performed when the dog is about five months old, and before it has had an estrual period. (b) The animal should not be operated during estruation, notwithstanding the prevailing belief of the laity to the contrary. As the ovaries and other portions of the generative tract are congested at this time, the danger of hemorrhage and inflammation is greater. One should wait two or three weeks after the period of estruation so that the organs can return to their normal condition. (c) The preparation of the animal before operating is of special importance. The bowels should be empty. For this purpose castor oil (15. to 60.) or other suitable agents, should be administered twenty-four hours previous to the operation. (d) It is considered a good policy to free animals of intestinal parasites previous to subjecting them to this operation and to passively immunize them against distemper by the use of homologous distemper serum. All solid food is withheld, but small amounts of milk and water only may be allowed. The field of operation may be prepared twenty-four hours previously; the hair removed, the skin washed with soap and water, and an antiseptic pack applied. This may be held in place by a special bandage made of a wide piece of muslin so as to extend from in front of the forelimbs to a point back of the field of operation, and tied over the back. This pack should be kept in position until the animal is ready for the operation. As a last precautionary measure, just previous to making the incision, the operating field is painted with tincture of iodine or a 5 to 10 per cent solution of mercurochrome. An anesthetic or narcotic should be given. In the dog various methods of anesthetization and narcotization have been employed, with equally good results. Morphine given as a subcutaneous injection about twenty to thirty minutes previous to the operation has been used with most excellent results. The value in this method of narcotization lies in the fact that it will cause vomiting in most cases, defecation in some, removing material from the stomach and bowels. Further, it will keep the animal quiet for several hours following the operating. It may be considered a perfectly safe narcotic, which to dogs can be administered in large doses. The amount to be administered will depend to a great extent upon the size of the animal. Usually from 0.016 to 0.2 are to be given.

Chloroform, ether or nembutal may be used as a general anesthetic; both are safe when administered properly. Nembutal administered intravenously is very effective and is preferred by many. Dose, 1 grain to each 5 pounds of weight. After anesthetization the animal should be placed in a dorsal position, well hobbled and the table tilted slightly to lower the head as much as possible. This assists the operator, as the bowels will descend toward the diaphragm which lessens the tendency for them to protrude through the incision. The incision may be made either at the median line or in the flank region. There are good reasons for choosing

the median incision. There is less hemorrhage at this location, it is much easier to locate the cornua and the removal of both ovaries through one opening can be done with less difficulty. The exact location for the incision in the median line is at a point about 1 to 1½ inches posterior to the umbilicus. The incision should be made of sufficient length so that light can be thrown into the abdominal cavity. The incision is made through the skin, separating the muscles down to the peritoneum. In making the incision through the peritoneum it is best to pick up a small portion of it with a forceps, nick with the scissors and enlarge with a probe-pointed knife. By this procedure injury to the bladder or other abdominal organs is avoided. The cornua are then successfully withdrawn by means of an ovariectomy hook or other suitable instrument. Some operators may remove the cornu by means of instruments through an incision so small as not to require the use of sutures. The ovary is distinguished by its consistency. In most cases in the dog it will be found imbedded in a capsule of fat. There are two methods of removing the ovary, and the choice of them will depend somewhat upon the condition of the gland. In young females, before the ovaries have fully matured, and in older ones between the periods of estrum, it is safe to remove them with an emasculator, unless considerable congestion is present. Where there is danger of hemorrhage, the ligation method is used. When this method is employed, sterile catgut should be put on securely so that it will not slip off after removing the ovary. Ligation should be made at two points, around the cornu posterior to the ovary, and around the vessels dorsal to the ovary. Care must be taken that all of the ovarian tissue is removed. Otherwise the females will again estruate, and the success of the operation will be incomplete. When removing the gland with the emasculator it must be pulled up sufficiently so that it will include all of the ovarian tissue. It is best to allow the instrument to remain in position a few moments. The cornu is then returned to the cavity.

The location of the ovaries is not difficult when the animal is properly prepared. Small, fat patients, with a short abdominal cavity, will present the greatest difficulties.

The abdominal incision is cleansed thoroughly and approximated by using two or more interrupted sutures. Suturing the abdominal walls may be done by using two rows of sutures one row including the peritoneum, and the other the skin and muscles, or may be closed by a single row including all of the tissues. This method has proved satisfactory. The abdominal walls should be accurately approximated as it facilitates adhesions and healing.

An antiseptic pack is applied and the regular bandage used to hold it in place. Dress the wound daily and in four to six days the sutures may be removed.

Sometimes animals are observed to estruate following this operation, and in such cases they should be reoperated, as it results in most instances from a failure to remove all of the ovarian tissue. Cysts will form in such cases leading to a continuance of the estrual period.

Oophorectomy in the Cat.—Cats are operated upon to correct pathological conditions, particularly cystic formations in the ovaries, which are very common in these animals, and also to prevent them from becoming

pregnant. They should be operated upon if possible prior to sexual maturity, and the best time is between the ages of three and seven months.

The same preparation should be made for the cat as in the case of the dog except that "000" barber clippers may be used in place of the razor in removing the hair from the operative area. The most satisfactory anesthetic is ether. The operative technique is the same as in the dog. It has been claimed that this operation is more dangerous in the cat than in other animals, but when done under proper conditions the mortality is very low. Experience has, however, shown that cats do best when returned home immediately following the operations as they do not always take kindly to confinement.

CHAPTER V

DISEASES OF THE UTERINE TUBES

Examination.—Examination of the uterine tubes is quite difficult, except by explorative laparotomy. They should be examined for inflammation, tumors, cysts, and pus accumulations. In some cases, when the animal is much emaciated, and the tubes large, it is possible to palpate them through the abdominal wall.

SALPINGITIS

Definition.—Inflammation of the uterine tubes.

Etiology.—Salpingitis occurs as a secondary condition following inflammation of other portions of the generative apparatus.

Symptoms.—The diagnosis is difficult unless laparotomy is resorted to. Other reproductive organs are usually also involved complicating the symptoms.

Treatment.—Very little can be done except complete extirpation of the affected tubes.

PYOSALPINX

Pyosalpinx is a purulent inflammation of the uterine tubes. It is secondary to other diseases of the reproductive organs. Removal of the uterine tubes is recommended.

TUMORS—CYSTS

These are found occasionally and when present should be extirpated.

CHAPTER VI

DISEASES OF THE UTERUS

Examination.—There are three principal ways in which an examination of the uterus may be made: (a) by abdominal palpation; (b) by obtaining the discharge from the uterus and noting the condition of the vulva and vagina; (c) by laparotomy.

(a) In abdominal palpation it is possible to determine various conditions involving the uterus. The patient should be placed in a standing position. With one hand on either side of it over the postero-inferior abdominal region, the operator by gentle pressure with the fingers can feel the uterus when distended, as an elongated suspended body, within the abdominal cavity. Palpation may be used to detect pregnancy, pyometra, hydrometra, tumors and inflammation. Sometimes in order to differentiate between these conditions it is necessary to make a general examination of the animal.

(b) In some of the conditions involving the uterus, there is a discharge from the vulva. The discharge should be collected and examined carefully, noting whether or not it consists of blood, mucus, pus, membranes, bacteria, etc. The microscope may be employed if necessary.

(c) By laparotomy it is possible to make a direct inspection of the uterus. It is advisable when there is evidence of serious involvement of the organ, and where the diagnosis is in doubt. The incision through the abdominal wall is made in the median line just anterior to the pubis, extending forward a sufficient distance to allow the uterus to be drawn out. The uterus may be enlarged. The external or serous covering should be observed for evidences of inflammation, hemorrhage, and rents or tears in the wall. Note the relative size of the two cornua, as compared to the size of the body of the uterus, their position and attachment. Tumors, pregnancy, etc., should be looked for. The consistency of the organ is important as it is modified by the character of its contents, whether fluid, or solid material. The entire organ should be carefully palpated for differential diagnosis between pregnancy, tumors, proliferative or fibroid endometritis, pyometra, hydrometra, etc. After a careful examination the uterus may be returned to the cavity or operated as the condition indicates.

envelopes. If not expelled after the normal time has elapsed they constitute a source of danger to the animal, as they form a favorable medium for the growth of bacteria. The retained membranes keep the cervix of the uterus open, which favors the introduction of bacteria, and interferes with the normal involution of the organ. Retained placenta is not as common in small animals as the membranes are usually passed with the fetus.

(b) Infection is introduced into the uterus at the time of parturition by the use of infected instruments or fingers used in cases of dystocia.

(c) Wounds of the mucosa of the vagina and uterus greatly facilitate the entrance of infection. Depending upon their depth, wounds may lead to metropéritonitis.

(d) The retention of a fetus or fetuses which decompose, irritate the mucosa, and, if allowed to remain for a long period, often produce grave symptoms of local inflammation and sapremia. In some cases the uterine mucosa is greatly changed by the infection. The uterus may be converted into a cavity filled with pus (pyometra).

(e) Slowness in the involution of the uterus from lack of muscular tone favors the introduction and development of infection. For the same reason individuals weakened from delayed parturition, systemic diseases, etc., are predisposed.

(f) In bitches and cats that are kept in cold, damp kennels, metritis is occasionally observed, and no doubt results from the general reduction in resistance, and from the weakened condition of the highly sensitive reproductive organs. This favors the development of microorganisms.

(g) In small animals injuries of various sorts are common, such as being kicked, run over by vehicles, or roughly handled by persons, especially during the latter stages of pregnancy. The uterus may be injured, sometimes torn or lacerated, and inflammation with infection is the common sequel.

Pathology.—In fatal cases of acute metritis, marked pathological changes are observed in the generative tract, and particularly in the uterus. The uterus is dark colored, in some cases almost black, the mucosa showing necrotic areas. In some instances the necrosis extends to the other tissues of the walls of the uterus, causing perforations. The walls of the uterus are thickened, edematous; the serous covering is often inflamed as are the adjacent organs and tissues in contact with it. Occasionally abscesses are found in the uterine walls, or in the surrounding tissues. In the virulent cases of metritis there will be found evidences of thrombosis of the blood-vessels of the uterus, leading to embolisms in the vessels in distant parts of the body, producing in some cases pyemic arthritis, etc. The vulva and vagina are swollen and necrotic, and a greenish-colored exudate of offensive odor is present. The other organs and tissues will show the usual post-mortem lesions of septicemia or pyemia. The blood is dark colored and fails to coagulate. The kidneys and liver are soft and congested. The musculature in general is pale, friable and soft.

Symptoms.—The first indication of metritis is a marked swelling and congestion of the vulva. On digital examination the parts will be found sensitive, very hot, and present on the mucosa a greenish or brown or blood-stained discharge which has a very fetid odor.

The vagina is swollen, very hot, and in the early stages, reddened and congested. Later it becomes dark or dark bluish, and in some cases almost

black in color, with a foul-smelling exudate. This discharge is more copious at times, as it is forced out of the uterus at different intervals.

Frequently the animal shows marked symptoms of straining, the abdominal muscles become tense, and quantities of a thick, dark-colored exudate are discharged from the vulva.

The temperature during the early stages is elevated (106° F.). Later, as the toxins are absorbed, the temperature drops to normal, often subnormal.

There are general symptoms of suppression of appetite, vomiting, general stiffness in walking and pain on palpation over the region of the uterus. The animal in most instances assumes the recumbent position.

In mild cases the symptoms will gradually disappear and terminate in complete recovery, or in chronic metritis.

Diagnosis.—The condition appearing as it does following parturition, with the characteristic discharge from the vulva, and the painful and sensitive condition of the uterus, makes the diagnosis rather easy. Careful examination should be made in all cases to establish a correct diagnosis and especially to differentiate acute metritis from puerperal septicemia and pyometra.

Prognosis.—In small animals, owing to the difficulties encountered in the treatment, and the retention of the exudate in the cornua, the prognosis is unfavorable. The milder cases recover but there is always danger, even in the mild cases, of chronic metritis or pyometra developing.

Treatment.—*Medical.*—Owing to the small uterus and the long cornua, irrigation is a more difficult problem than in larger animals. However, it should be attempted as good results often follow thorough irrigation. Boric acid (2 per cent); normal salt solution; creolin (1 per cent); lysol (1 per cent); or theropogen (2 per cent) may be used as follows: a small metallic catheter or flexible human male catheter is inserted into the uterus and a rubber tube and funnel attached to the free end. The antiseptic solution is allowed to flow into the uterus by gravity. After $\frac{1}{4}$ to 1 pint of the solution is introduced the tube should be lowered and the fluid allowed to flow out. The catheter is introduced into each cornua. This treatment should be applied every three or four hours to keep up the antiseptic action, to remove the exudate and to prevent absorption and the resulting general symptoms.

Small doses of ergot or other ecbolies should be administered once daily to stimulate the uterus and to hasten its involution.

Surgical.—In severe forms of acute metritis, and in cases where medicinal treatment does not relieve, it is advisable to remove the uterus and ovaries by performing laparo-hystero-oöphorectomy.

Chronic Metritis.—*Pyometra.*—**Definition.**—A chronic inflammation of the uterus, characterized by the formation and collection of pus in the uterine cavity. In case the cervical canal becomes closed, retaining the pus, the uterus may be converted into a veritable abscess. Chronic metritis occurs quite frequently in the bitch; less commonly in cats. It makes its appearance in most cases following parturition, at any period in the animal's life, but may be found in females that have never given birth to young.

Etiology.—(a) Commonly a sequel to acute metritis, the acute symptoms disappearing, leaving behind bacteria of a low virulence, which keep up a

constant irritation to the mucosa resulting in chronic inflammation with pus formation.

(b) Infection gaining entrance to some portion of the reproductive organs which may find its way to the uterus direct, or by extension of the process from other parts or adjacent tissues, leading to a primary inflammation of chronic type.

(c) Following parturition it frequently happens that a small portion of the placenta is retained leading to a slowly developing inflammation with pus formation.

(d) Injuries of a mild character during parturition, or at other periods, reduce the general resistance of the animal and particularly the local resistance of the uterus allowing infection to develop. In these cases we will often find that the female has never been pregnant. Such cases tend to develop into uterine abscess.

(e) Anything which reduces the resistance of the reproductive organs or the animal's general resistance has a tendency to favor the formation of this condition. Exposure is a predisposing factor.

Pathology.—The presence of pus in varying quantity in the uterus. The pus is thick, viscid, dark or reddish, sometimes reddish-gray in color and of offensive odor. The walls of the uterus are much thickened, dilated, and in some cases enormously distended with pus (uterine abscess). The mucosa is dark in color, soft, spongy, and shows numerous elevations of various sizes. The process can extend into both cornua. In general the animal will show emaciation, the muscles are pale, soft and friable. Secondary abscesses are often observed in the kidneys, liver and lungs.

Symptoms.—The most prominent symptom is the chronic discharge from the vulva, which varies in quantity, being more copious at certain times than at others. This is due to the fact that it accumulates in the uterus until a certain distention of the organ is reached, when it will be ejected. The discharge is grayish-red, or dark red in color, and of fetid odor. It soils the tail, limbs, and hair around the vulva. In uterine abscess, with occlusion of the cervical canal, the discharge will be absent.

Enlargement of the Abdomen.—In all cases, and particularly in uterine abscess, there is a marked increase in the size of the abdominal cavity which may simulate pregnancy.

Careful palpation should be made especially in distention of the uterus with no discharge from the vulva (uterine abscess).

General Symptoms.—In many cases of chronic metritis systemic disturbances are noted; they are general emaciation, weakness, rough hair coat, a variable appetite and temperature. Rheumatic symptoms may also be present.

Diagnosis.—Diagnosis does not present any difficulty when the symptoms

ment is necessary in order to properly overcome the general symptoms. An early removal of the uterus and ovaries will prevent metastatic abscesses developing in the kidneys, liver, etc. The operation is as follows: the animal should be given a general anesthetic and placed on the operating table in the dorsal position with head lowered. The incision is made in the median line, beginning just anterior to the pubis and extending forward a sufficient distance to allow the uterus to be drawn out of the abdominal cavity. Sterile catgut is applied around the vessels dorsal to the ovary, and around the uterus just anterior to the cervix. The ligature around the uterus should be placed in sections, and then around the entire part to prevent it from slipping off and fatal hemorrhage resulting. The entire portion between the ligatures is then separated with knife or scissors, and the stumps returned to the abdominal cavity. Before, however, returning the stump of the uterus to the cavity the cut surface should be cauterized by the use of phenol and later swabbed with alcohol. The abdominal incision is cared for in the regular way.

In the case of collapse or weakness following the operation small doses of strychnine (0.001) should be given.

Diagnosis.—This is made on the sudden onset, the severe general symptoms, the high temperature in the early stages, and the characteristic involvement of the reproductive organs. Puerperal septicemia should be differentiated from acute and chronic metritis which can be made by a careful examination of the patient.

Prognosis.—The prognosis is unfavorable, most cases terminating fatally. Mild cases often recover; more severe ones may recover if treatment can be applied early.

Treatment.—*Medical.*—In cases of marked collapse, subnormal temperature, etc., stimulants, such as aromatic spirits of ammonia, spirits of camphor, oil of camphor, or strychnine should be administered early.

Surgical.—As local applications in the form of irrigation with antiseptics have proved unsatisfactory, an early operation is advised. Before operating obviously the genital tract should be flushed with antiseptics. The animal should be anesthetized and operated as in chronic metritis. (See Chronic Metritis.) Care must be exercised in preventing infection of the serous membrane of the abdominal cavity. The stump of the uterus should be inverted and thoroughly disinfected before it is returned to the abdominal cavity.

The after-treatment is very important, and prompt remedial agents (stimulants) should be administered.

Irrigation of the vagina should be done at regular intervals to control local infection. Normal salt solution should be used in cases of collapse following the operation. It may be injected intraperitoneally or intravenously.

EVERSION OF THE UTERUS

Prolapse—Inversion of the Uterus

Eversion of the uterus is not common in the small multiparous animals, particularly in the dog and cat. The small uterus and long cornua present an anatomical arrangement which tends to prevent eversion except in rare instances.

It is occasionally observed in the bitch following parturition. The eversion in most cases consists of an invagination of the anterior extremity of the cornu into the succeeding portion, and should the process continue, it will appear at the vulva or even project outside. In most cases the prolapsed portion will consist of one cornu and a portion of the uterus. However, in a few instances there will be found a complete eversion of both cornua, the body of the uterus and a portion of the vagina. The prolapse of one cornu through the uterus usually prevents the other one following.

Symptoms.—The early indications are the expulsive efforts of the animal which are very similar to those noted in parturition. The animal becomes uneasy, looking at its sides, licking the vulva, etc. When such symptoms occur following parturition, the uterus should be examined. The local symptoms after the uterus appears at the vulva, are quite characteristic. There is rounded enlargement between the lips of the vulva, at first only slightly congested and swollen, later considerably swollen and changed in color to a dark-red or almost black. When the organ has been prolapsed

for some time, the mucosa becomes darker, covered with a thick greenish or purulent exudate, and in some cases extensively gangrenous.

General symptoms of anxiety, restlessness, dyspnea, increased labor pains, and later septicemia are observed.

Diagnosis.—In small animals care should be taken to differentiate eversion of the uterus from prolapse of the vagina or its mucosa, tumors, etc. This can be done by inserting the finger around the periphery of the enlargement to determine its point of origin. Further, the characteristics of the prolapsed portion will assist in the diagnosis. In later stages, when necrosis has developed with much swelling of adjacent tissues, the diagnosis is more difficult.

Prognosis.—Several things tend to alter the prognosis. More favorable are those cases of recent development, and especially before extensive pathological changes have taken place in the uterus. The prognosis is unfavorable if amputation of the uterus is necessary on account of the danger of septicemia. The prognosis is unfavorable from the standpoint of breeding.

Treatment.—In case the prolapse is of recent development reposition should be attempted at once. The parts should be thoroughly cleansed with antiseptics and astringents. Reposition should be attempted by gentle pressure on the prolapsed portion. Patience is often necessary to effect reposition. In case this does not succeed, it is advisable to perform laparotomy under anesthesia, and pull the uterus back into position. Care should always be taken to avoid tearing the tissues, and it is best to have an assistant manipulate the parts in the vulva, and at the same time exert some pressure so that the entire prolapsed portion will at the same time go back into position. It is advisable to attach the uterus to the abdominal wall after it has been replaced in order to prevent further prolapsus. This can be done easily by simply including the serous and muscular coats of the uterus in the sutures when closing the abdominal wall.

In case the prolapsed portion is necrotic or gangrenous it should be amputated at once. The parts are cleansed thoroughly with antiseptics, and the prolapsed portion drawn out from the vulva until healthy tissue appears. A ligature is applied around the entire mass as high up as possible. It should be placed in position by drawing it tight to avoid post-amputation hemorrhage. The mass is then removed with a scissors or knife. Hemorrhage should be controlled, if present. The stump is thoroughly washed with antiseptics and returned to the vagina. The vagina should be irrigated with antiseptics for a few days following the operation.

TORSION OF THE CORNUA UTERI

This is a condition occurring occasionally in bitches previous to or at the time of parturition. A twist occurs at the junction of the cornua with the body of the uterus, preventing the birth of the fetuses.

Symptoms.—No special symptom of torsion of the cornua will be observed. It may be necessary to make a careful examination to reveal the exact condition; in some cases an explorative laparotomy must be made.

Treatment.—The torsion can be reduced by performing laparotomy. In case it is found that the circulation has been so disturbed as to cause necrosis, it will be best to amputate the entire organ.

RUPTURE OF THE UTERUS

Rupture of the uterus has been observed in both the bitch and cat. It may be due to unequal uterine contractions, or to the rough use of instruments at parturition.

The rupture may be small, simply allowing some of the fluids from the uterus to escape into the abdominal cavity, or may be of sufficient size to allow the fetus to pass through. This is usually a serious condition on account of the infection getting into the abdominal cavity, producing septic peritonitis.

Symptoms.—The stoppage of the labor pains, and the sudden prostration of the animal are the most characteristic symptoms. Examination should be made by inserting the finger through the vagina into the uterus and at the same time with the other hand pushing upward and backward on the fetus. If there is membrane between the fetus and finger, one should suspect that the fetus is in the abdominal cavity. Laparotomy should be performed at once to make a positive diagnosis.

Prognosis.—The prognosis is unfavorable owing to the danger of peritonitis.

Treatment.—Prompt surgical treatment should be given. The fetus and membranes should at once be removed, and the abdominal cavity flushed thoroughly with normal salt solution. The rent in the uterus is closed with Lambert sutures. Gauze is placed between two of the sutures in the abdominal wall to afford drainage. In thirty-six hours this may be removed.

TUMORS OF THE UTERUS

Prognosis.—Favorable.

Treatment.—*Surgical.*—Surgical interference by complete removal of the uterus and ovaries is indicated. When the tumors are found projecting through the os into the vagina, they should be withdrawn into the abdominal cavity and extirpated.

Myomata.—In myomatous tumors of the muscular walls of the uterus, the symptoms, diagnosis and treatment are the same as for fibromatous.

Hydrometra.—*Definition.*—A collection of transudate or other sterile fluid in the uterus.

Etiology.—Occlusion of the cervix, or any portion of the uterus which prevents the escape of fluid.

Inflammation of the cervix (endocervicitis) resulting from wounds and injuries during parturition.

Pressure of inguinal hernia producing occlusion.

It may be produced by ligation of the uterus, as is done occasionally to prevent pregnancy. It may develop as a simple hydrometra, in which case there will be no serious effects upon the animal.

Symptoms.—Distention of the abdomen which becomes pronounced and simulates pregnancy. Its persistence and the absence of lactation differentiate it from pregnancy, however. There are no general symptoms, no pain on manipulation of the abdomen, and no change in the other parts of the reproductive organs.

Diagnosis.—Hydrometra should not be confused with pregnancy, tumors of the uterus, ascites, and pyometra. A laparotomy may be necessary to make an accurate diagnosis.

Prognosis.—Favorable.

Treatment.—If due to an inguinal hernia, a surgical operation is necessary for relief. In other cases the entire uterus together with the ovaries should be removed.

2. It has been observed frequently that environment has a great deal to do with producing dystocia in the bitch. Animals that are kept closely confined, fed highly nutritious food, and are not exercised, are more predisposed to parturition difficulties. Some breeds are more often affected than others, perhaps due in most cases to the manner in which they are cared for.

3. Mating animals of extremes in size, particularly a small female bred to large male. The young will be too large in some cases to be expelled.

4. Young females at the first birth are more commonly affected with dystocia than at later periods.

5. Females when bred before reaching complete maturity often will have difficulty at the time of parturition.

Symptoms.—In normal parturition it requires from three to thirty-six hours for the birth of the young. It depends somewhat on the number of fetuses, and the condition of the animal. Therefore it is sometimes difficult to determine accurately the time at which dystocia begins. The principal symptoms of dystocia are: extreme restlessness; severe labor pains at first, later their cessation; discharge from the vagina; general weakness.

Examination of the patient will determine the condition. The following examination should be made in these cases:

Note the general condition in regard to pulse, respiration and temperature. Note the physical condition.

Palpate the abdominal region to determine whether any young are present. Differentiate between the presence of fetuses and other enlargements commonly found in this location.

Note the condition of the external genitals; the discharge from the vulva. With the use of sterile rubber gloves palpate through the vagina. If the fetus has been presented at the pelvic inlet, it can be felt. If still in the uterus it may not be determined by vaginal palpation. In palpating note the condition of the pelvic canal, whether constricted, tumors present, etc.

Diagnosis.—If the labor pains are normal and no impediment to the passage of the young through the pelvic canal is apparent, and the animal is in good physical condition, we should allow more time to elapse before assuming it to be a case of dystocia. However, if the animal is weak, the general condition disturbed, labor pains absent, etc., we are justified in diagnosing dystocia.

Prognosis.—Favorable in most cases. Will depend upon (a) the condition of the animal, (b) the length of time in labor, and (c) the condition of the fetus and membranes.

Treatment.—A thorough examination of the patient should be made at once to determine the proper treatment to use. There are three lines of treatment recommended in dystocia.

Medical.—This is indicated in cases when there is no apparent impediment to the passage of the fetus, and when the labor pains are weak and insufficient. Extract of ergot (0.5 to 2.) or pituitrin (3. to 10.) depending on the size of the animal may be given. These doses may be repeated in a few hours if necessary. Pituitrin is being used quite successfully in such cases.

Forced Extraction of the Fetus.—Examination is made of the condition of the birth canal and the position of the fetus noted. Various forms of instruments have been recommended for this work. Perhaps the most satisfactory ones are the smallest forceps, a rather blunt vulsellum forceps,

and a wire snare. These instruments should be thoroughly disinfected, and the vagina washed with an antiseptic and lubricant solution (creolin, 2 per cent; lysol, 1 per cent). The method of manipulation will depend upon the position, presentation, and condition of the fetus. All manipulating with the instruments should be done carefully to avoid injuring the vaginal mucosa. An assistant who exerts pressure on the abdominal walls in a backward direction will often help in keeping the fetus in position until the instrument is firmly attached. Gentle traction should be used. This method when done carefully will often overcome the difficulty.

Hysterotomy.—After examination of the patient it is found that it is impossible for the fetus to be born, or after the other methods of treatment have failed, it is advisable to perform hysterotomy as early as possible. Delay in performing the operation is often fatal on account of the infection in the uterus from resulting sapremia or septicemia.

The animal is anesthetized, placed on the table in a dorsal position, well hopped. An incision is made through the abdominal wall in the median line just anterior to the pubis and extended forward about 3 to 4 inches. The uterus will at once be seen as a voluminous body. It is withdrawn carefully from the cavity well surrounded by sterile gauze to prevent fluids from flowing back into the abdominal cavity. An incision is made through the walls of the uterus of sufficient size to allow the fetus or fetuses to be withdrawn. If there should be fetuses in either of the cornua they can be removed through the same opening. The membranes and any other material should be removed from the uterus. The incision in the uterus is closed with Lembert sutures and returned to the abdominal cavity. The abdominal incision closed as usual.

General stimulants should be administered following the operation.

Hysterectomy is advisable in cases where there is evidence of puerperal infection. (See Chronic Metritis.)

CHAPTER VII

DISEASES OF THE VAGINA AND VULVA

Examination.—It is possible to make a thorough examination of the vagina and vulva by direct inspection. The animal should be placed in a dorsal position with the hind limbs hopped forward. The vulva can be inspected directly by separating the labia with the fingers. The condition of the mucosa should be observed, any wounds or injuries carefully examined to determine their depth and extent. Note the color of the mucosa. It should be remembered that in the bitch there is often a normal pigmentation of the mucosa which should not be mistaken for some diseased condition. Papillomata and fibromata are commonly found at the juncture of the skin and mucous membrane. The vagina may be inspected by using a speculum to dilate the vulva and a portion of the vagina so that the mucosa can be seen. It is best to use an artificial light with a reflector to observe the mucosa farther into the pelvic canal. The mucosa should be examined for wounds and injuries which are common sequels to dystocia, inflammation, tumors, prolapsus, constrictions, etc.

CONGENITAL MALFORMATIONS

Various forms of malformations have been observed in the bitch and cat. Stenosis of the vagina is seen occasionally. Imperfect development of the vulva, vagina and anus during fetal life has been noted. These conditions may interfere with copulation and impregnation. When found an attempt should be made to correct them surgically.

VAGINITIS AND VULVITIS

Definition.—An acute or chronic inflammation of the vagina and vulva. These are very common conditions found in both the bitch and cat.

Etiology.—Mechanically there are a number of conditions which bring about inflammation of these parts. Anything causing bruising of the mucosa will result in an inflammatory condition varying in degree and depending upon the extent of the injury. Lacerations and abrasions of the mucosa make possible the entrance of bacteria with resultant inflammation. During dystocia, wounds, and lacerations of the vulva and vagina are very common from rough manipulations and sharp instruments. At this time the animal's general resistance is materially reduced and serious infection and infiltration of the tissues can take place. Infection is frequently introduced by infected fingers or instruments. Another factor of importance in these cases following dystocia is the fact that in the extraction of the fetus, or the discharge of the secretions from the uterus, the vagina is further exposed to infectious material.

Foreign bodies finding their way into the vagina will produce inflammatory conditions depending upon the kind of foreign body and the extent of the injury done by the same. Tumors in the vaginal wall usually produce a chronic inflammation.

Symptoms.—Acute inflammation of the vulva is apparent from the swelling of the labia and the congestion of the mucous membrane. The color of the mucosa is at first red, later of a bluish, or greenish-black, depending upon the stage of the inflammatory process. At first there is no discharge, but later a mucous or mucopurulent discharge is observed. In acute vaginitis the mucosa will be red in color, swollen, and in most cases the seat of the injury or infection will be observed. The animal will be restless, often shows symptoms of straining as if to urinate. General symptoms of elevation of temperature, disturbances in the circulation and respiration are often observed from the absorption of the toxins, or the presence of microorganisms in the blood. In chronic vaginitis the principal symptom is the chronic, whitish, purulent discharge from the vulva. Examination reveals the chronic inflammatory changes of the mucosa of the vagina and vulva. In most of these cases it is difficult to make a distinction between the two conditions as they are nearly always associated except in injuries.

Diagnosis.—This is made by a direct inspection of the mucosa.

Prognosis.—Favorable in most cases, unless general symptoms of septicemia are present, or in some cases of extensive laceration of the mucous membrane.

Treatment.—The parts should be thoroughly cleansed with mild antiseptics (lysol, 2 per cent), followed by weak solutions of astringents (silver nitrate, 0.25 per cent, or silver citrate 0.5 per cent). These applications should be made daily.

In case any foreign bodies are present, they should be removed and antiseptic treatment applied. When the vulva or vagina is found lacerated the extent of the wound should be determined by probing, all loose fragments removed with the scissors, and antiseptics used as above.

In gangrenous conditions of the vulva or mucosa, all such portions must be removed promptly, and the surface treated thoroughly with antiseptic solutions. It is sometimes necessary in recent wounds of the vulva to apply one or more sutures to properly approximate the torn edges to prevent improper union.

PROLAPSE OF THE VAGINA

A true prolapsus of the vagina is uncommon in small animals. A hypertrophic condition of a portion of the mucosa which protrudes through the vulvar opening is frequently mistaken for prolapsus. This, however, is not a true prolapsus, but inasmuch as it simulates the condition, it will be described with prolapsus.

Etiology.—Prolapse of the vagina may result from injuries during copulation, the penis, which is forcibly withdrawn before ejaculation has taken place, pulling the vaginal mucosa out with it.

Results also from severe straining, and from inflammation of the mucosa. Hypertrophy of the mucosa is observed frequently on some of the larger breeds, Great Danes, St. Bernards, and becomes chronic and especially prominent following the estrual period. It consists of simply a chronic inflammation which is most marked during estruation.

Symptoms.—The condition is characterized by an enlargement appearing at the vulvar opening. At first the prolapsus is a red, congested mass, which later, on exposure, becomes dark in color and gangrenous. In

hypertrophy of the mucosa it appears as a rounded enlargement of rather firm consistency projecting through the vulvar opening and coming from one side of the vaginal wall. In some cases it will remain outside of the vulva, becoming dark in color and gangrenous on the surface; or it may not protrude beyond the vulvar opening and appear only at intervals. Usually there are no general symptoms. There may be some interference with micturition.

Diagnosis.—This is not difficult in most cases. A thorough manual examination should be made to determine the exact conditions present.

Prognosis.—Favorable.

Treatment.—In prolapsus of the vagina an attempt should be made to replace it. The parts should be cleansed, disinfected and if there is much congestion, astringents (alum, 2 per cent) may be used. In some cases this will be sufficient, in others, when there is a recurrence of the condition without necrosis or gangrene, it should be returned and if necessary held in place by temporary sutures through the labia of the vulva. They should be placed so that the urine can be voided. Remove them in twenty-four to forty-eight hours. When gangrene sets in, amputation of the prolapsed portion becomes necessary. This is done by grasping the mass and withdrawing it until the normal mucosa appears. If the prolapsus involves only a portion of the circumference of the vagina it may be ligated. The ligature should be inserted through the base of the mass and drawn securely to control hemorrhage and stop absorption. In case the vagina is prolapsed, throughout its whole circumference sectional suturing will be necessary. Care must be taken in all cases to avoid injuring the urethra. In hypertrophy of the mucosa amputation of the mass is necessary. This is done by thorough cleansing and disinfecting the parts, withdrawing the mass from the vulva, and ligating through its base. The mass should be removed with the knife or scissors and the stump returned to the vagina. The vagina should be cleansed daily with antiseptics until the discharge has ceased.

RUPTURE OF THE VAGINA

During dystocia from rough manipulation or from sharp instruments, the vagina may be torn or ruptured, making at once an opening into the abdominal cavity. This will allow septic material to gain entrance which usually produces peritonitis. In some cases after rupture of the vagina, and when straining is induced, or still present from the dystocia, there may be a prolapsus of the bladder through the rent. When this occurs the bladder becomes displaced and projects from the vulva. It will be recognized as a fluctuating enlargement appearing suddenly between the labia of the vulva. An exploring trocar may be used to determine its contents if the diagnosis is in doubt. Laparotomy should be performed at once (see Laparotomy) and the displaced organs returned to their normal position. If possible close the opening in the vagina. If septic infection has developed little can be done.

TUMORS OF THE VULVA AND VAGINA

The majority of the neoplasms found in the vulva and vagina are benign growths consisting in most instances of fibromata, papillomata, or a mixture of fibromata with myxomatous, myomatous, or lipomatous elements.

Malignant tumors are uncommon in the vagina, but do occur occasionally as secondary growths, or in the form of venereal granulomata.

Fibromata.—These are found in most instances projecting from the walls of the vagina, or from the cervix. They appear as firm enlargements, usually smooth on the surface, show no tendency to degeneration or necrosis, except when they project through the vulva and become irritated from exposure.

Diagnosis.—Made by the character of the enlargement, its slow growth and finally by a microscopic examination.

Prognosis.—Favorable in most cases.

Treatment.—Complete amputation should be done as early as possible. Ligation, the same as for hypertrophy of the mucosa, is perhaps the most satisfactory method.

Papillomata.—These occur at the juncture of the skin and mucous membrane of the vulva. They appear as small, rounded, pedunculated (usually) tumors. They often have a roughened surface.

Treatment.—Papillomata should be removed with the scissors, and the bases cauterized with silver nitrate. They rarely reappear.

Sarcomata.—These are found occasionally on the vaginal mucosa. They are characterized by their rather rapid growth, uneven surface, and tendency to spread to adjacent structures. If possible a small section should be obtained for microscopic examination.

Treatment.—Treatment is unsatisfactory and should not be attempted.

Venereal Granulomata.—Venereal granulomata have been described under venereal granulomata in the male animal. In the female they appear on the mucosa of the vulva and at the posterior portion of the vagina. They consist of progressive neoplasms varying in rapidity of growth.

Treatment.—Complete removal should be attempted, except in very advanced cases.

CHAPTER VIII

DISEASES OF THE MAMMARY GLANDS

Examination.—These glands may be examined by observing their size, condition, and by palpation to note their consistency or the presence of wounds, inflammation, abscesses, etc.

WOUNDS AND INJURIES OF THE MAMMARY GLANDS

In the bitch and cat, wounds and bruises of the mammary glands are quite common. They result in most instances from being run over by vehicles, by falling, from bites of other animals, or the glands may be punctured by sharp objects. The degree of injury will vary greatly. In some cases it will consist in a simple, slight contusion of the glandular substance; in others bruising with hemorrhage into the gland producing a hematoma, and in some cases abscesses result. A careful examination should be made to determine the degree and extent of the injury.

Treatment.—The treatment will depend to a great extent on the condition of the glands. In slight contusions but little treatment is necessary, while in more extensive bruising, warm applications should be applied in the form of a warm antiseptic pack containing lysol (2 per cent). In open wounds their extent should be determined and treated with antiseptics. An antiseptic pack may be applied when the animal interferes with the wound by biting or licking it excessively.

When abscesses develop in the gland, they should be opened freely to allow good drainage and the wound treated as above. In most cases recovery takes place promptly. If fistula or necrosis of the gland should develop, it may be amputated.

CONGESTION OF THE MAMMARY GLANDS

A normal condition occurring at the end of the gestation period, and during lactation. It has been observed in non-pregnant and virgin animals. The glands become enlarged, hot, and sensitive. No treatment is necessary.

MAMMITIS—MASTITIS

Definition.—An inflammation of the mammary glands. The inflammation may involve one or more of the glands. Mastitis is a common condition in bitches and cats shortly after parturition.

Etiology.—In the majority of cases mastitis is due to infection. Pyogenic organisms enter usually through the teat canal to the acini of the gland, and from this point spread to the perilobular lymphatics.

Premature removal of the young seems to be a predisposing factor as it permits the milk to collect, congesting the gland as is often noted in cats. Streptococcus infection of the mammary glands of the cat has been quite often observed. It frequently has the appearance of a specific disease appearing as an enzootic in catteries. Wounds and contusions of the gland will produce mammitis and the degree will depend upon whether or not

there is infection. Chronic mammitis is observed occasionally in the bitch and cat, resulting either from acute mammitis, or occurring independently.

Symptoms.—One or more of the mammary glands are swollen, and very sensitive on palpation. As there are no milk cisterns in the gland, the condition extends immediately to the glandular tissue producing marked inflammation and edema of portions of the glands. On palpation the portion affected can be detected. Later as the infection develops the milk will be found changed into a grayish, purulent mass sometimes mixed with blood. Abscesses, often multiple, frequently develop. They open and discharge a reddish, purulent mass. General symptoms are quite marked in some cases, especially in cats. The toxins absorbed produce general intoxication which is often fatal.

In the chronic form the glands become indurated and the milk canals obliterated. The gland tissue becomes fibroid in character.

Prognosis.—The prognosis is favorable in animals other than the cat. When general symptoms are present the prognosis should be guarded.

Treatment.—The milk is removed, and the glands thoroughly massaged to remove as much of the infective material as possible. Hot antiseptic packs or fomentations of hot antiseptic solutions should be applied. These should be changed every few hours if feasible. Avoid coal-tar products in cats.

Should abscesses develop in the glands they are incised to give free drainage. Follow with antiseptics. Small doses of castor oil, or magnesium sulfate are indicated to assist in the elimination of toxins. In chronic mammitis with fibrosis which may also involve the teat, it is best to remove the gland. An anesthetic should be given, and the animal placed on the table in the dorsal position. The hair is shaved from around the gland and the skin thoroughly disinfected. The gland is then dissected out, which is not difficult, and the vessels ligated. The skin should be trimmed so that the edges approximate accurately. A regular bitch bandage is applied to protect the wound. Recovery is prompt.

Symptoms.—They are soft, well-defined tumors of the gland.

Prognosis.—Favorable.

Treatment.—Removal of the gland is advisable.

Malignant Tumors.—Carcinomata.—A very common form of malignant growth found in the mammary gland. They are frequently mixed tumors, appearing as adenocarcinoma, fibrocarcinoma, etc.



FIG. 14.—Mammary tumor.

Symptoms.—Carcinomata are characterized by their growth, slow at first but with sudden, rapid development, lobulated appearance, and tendency to degeneration and abscess formation. A small portion of the tumor should be examined microscopically.

Prognosis.—Unfavorable as they are apt to recur.

Treatment.—Removal of the gland should be done as early as possible. When metastasis has taken place, no treatment is successful.

Sarcomata.—Sarcomata occur usually in conjunction with other varieties of tumor, as fibrosarcoma, adenosarcoma, etc.

Symptoms.—Sarcomata develop rapidly with acute, inflammatory symptoms.

Diagnosis.—A diagnosis can be made only by microscopic examination.

Treatment.—Same as for carcinoma.

Other varieties of tumors which involve the mammary glands are rare and of minor importance.

PART V

DISEASES OF THE BLOOD AND BLOOD-PRODUCING ORGANS

CHAPTER I

DISEASES OF THE BLOOD

ANEMIA

Definition.—A reduction in the total volume of blood or of its corpuscles, oligocythemia, or of certain of its more important constituents, such as albumin and hemoglobin. Two forms of anemia are recognized, *viz.*: (a) acute, and (b) chronic.

Occurrence.—Very frequently observed in dogs and cats. The most common form is the acute. The chronic form following various diseases is also of common occurrence.

Etiology.—(a) Many cases of acute anemia are the direct result of loss of blood. The condition develops rapidly following epistaxis, intestinal hemorrhage, rupture of blood-vessels in the lungs, hemorrhage of the uterus, parenchymatous hemorrhage, or any external, severe hemorrhage.

(b) Chronic anemia develops slowly and gradually. Several different causes are found producing this type: insufficient food, or food of poor quality in which the essential nutritive elements are deficient; diseases of metabolism in which the nutritive processes are modified and the food elements not utilized in the body. In small animals anemia often follows diseases of the digestive tract (catarrhal inflammation) producing either a loss of appetite or an interference in the digestion and assimilation of the food. This may occur following distemper in dogs, presence of parasites in large numbers, or other diseases affecting the mucous membranes in a similar manner. Many of the general diseases are accompanied by anemia.

Pathology.—The most characteristic feature of acute anemia is the paleness of all the tissues and the absence of blood. The respiratory passages show evidence of lack of blood by their pale, pink color. The heart and blood-vessels are only partially filled with a loose coagulated blood. In chronic anemia the membranes are found pale and colorless, the blood present in the vessels and tissues low in coloring matter, and usually reduced in total volume. Fatty degeneration of the heart, liver, kidneys and other organs is often observed. Owing to the general weakness and emaciation, transudation of serum takes place and is found present in the thoracic and abdominal cavities in varying quantities. Lesions of the primary condition producing anemia are often apparent.

Symptoms.—(a) *Acute Anemia.*—The symptoms of acute anemia, when due to hemorrhage, come on suddenly, and depend upon the amount of blood lost. The patient becomes very weak, may be unable to stand, or if standing does so with difficulty. In attempts at walking the animal will show muscular incoördination and frequently falls down. Depression, subnormal temperature and increased respirations are prominent symp-

toms. The mucous membranes are pale or colorless and the heart action may be very weak or imperceptible. In some instances evidence of the hemorrhage will be present by the discharge of blood either from the nasal passages, mouth or wound. Many cases terminate fatally in a few minutes, or hours, when the hemorrhage is severe.

(b) *Chronic Anemia*.—In chronic anemia the symptoms come on more slowly and gradually with more or less emaciation and general debility. The hair coat becomes rough, and the eyes sunken. The animal is easily fatigued, and unsteady in its movements. It will lie down much of the time and refuses to move or get up when called. The mucous membranes are pale or colorless. The heart action is irregular, the pulse weak, and the respirations shallow and accelerated. The appetite becomes variable and entirely suppressed in some cases; in others it is retained but weakness and emaciation continue. The blood when examined will show a reduction in hemoglobin content and the number of red corpuscles diminished in proportion to the number of white. Later as the disease progresses edematous swellings are found along the abdomen, under the neck, and on the limbs. Other symptoms may be present depending upon the complicating conditions present.

Course.—The course of acute anemia is short, lasting in the majority of cases only a few hours. In the chronic form the course is much longer lasting for several weeks or months. In this case the course will depend very largely upon the cause of the condition.

Diagnosis.—The diagnosis does not present any difficulty. This is particularly true in the acute form. A differential diagnosis is necessary in some cases to distinguish it from diseases of the heart, or leukemia. In the former the examination of the heart will reveal the difference, while in the latter case an examination of the blood will at once make clear the distinction between the two conditions.

Prognosis.—The acute form, providing the animal does not succumb from the hemorrhage, will disappear promptly. The elements of the blood will soon be normal from the drinking of large quantities of water and ingesting nutritious foods.

In the chronic form the prognosis is not considered very favorable. It will depend largely upon the primary factor producing the anemia. A careful examination should be made in all cases to determine if possible the actual conditions. Many patients will recover completely after the elimination of the causative factor.

Treatment.—In acute anemia when hemorrhage is taking place an attempt should be made to arrest it at once. If it is external, the vessels should either be ligated or, if this is impossible, pack the wound and apply a bandage to compress the vessels. Internal hemorrhage may be controlled by administering hemostatics. Adrenalin chloride solution (1 to 1000), using 1 to 2 cc. intravenously. This may be repeated in thirty minutes if necessary. Ergot and fluidextract of hydrastis may also be used.

Rectal injections of normal salt solution are recommended. Inject the solution as high up into the rectum as possible. The solution should be at or near the body temperature. Intravenous injection of salt solution in small animals is possible. In the chronic form determine the cause of the condition if possible and apply treatment to correct it. Blood transfusions are often used.

The diet is an important thing in the treatment of anemia. Foods should be given that are rich in protein. Meat and meat scraps, milk and eggs have proved of great value. These substances should be given frequently and in small quantities to obtain the maximum benefit. Later the amount and the time between the feeding periods can be increased. Numerous medicinal preparations have been used, but the iron compounds have given the best results. Iron and quinine citrate in doses of 0.1 to 0.5 twice daily are of great value as a general tonic and alterative. Reduced iron, saccharated carbonate of iron, and sulfate of iron have been used successfully. Small doses of these preparations can be given for a few weeks if necessary. Fowler's solution of arsenic in doses of 0.1 to 0.8 daily is excellent. Carlsbad salts should be given in small doses along with the iron preparations. Hepatic extract injected intramuscularly every three days has given good results. Good hygienic conditions should always be observed.

LEUKEMIA

Definition.—A disease characterized by an increase in the white corpuscles, together with changes in the spleen, lymph glands or bone-marrow. Two forms are recognized, *viz.*: (a) myelogenous, and (b) lymphatic. The distinction is based on whether there is an increase in the leukocytes or lymphocytes. Combination of the two conditions may be found, or variations and degrees of either of the two forms may be present.

Occurrence.—This disease occurs most frequently in dogs, occasionally in cats.

Etiology.—Nothing is definitely proved relative to the cause of leukemia. The disease is probably of an infectious origin, but experiments conducted along this line have given negative results. Toxic agents have been given as the cause, as have injuries and various other factors.

Pathology.—On necropsy in leukemia it is often difficult to make a distinction between the two forms as the lesions of both occur concomitantly in the majority of cases. It is characterized by enlargement of the spleen, lymph glands, liver, kidneys and distinct changes in the marrow of the bones.

The spleen is enlarged (in some instances three to four times its normal size), dense and often easily torn. Frequently nodules are seen projecting from its surface. The color is dark red, and on cut surface dry, and shows numerous whitish colored, enlarged follicles each of about the size of a wheat grain. The stroma of the gland and the capsule are thickened.

The lymph glands are found enlarged. They are harder or softer than normal, of a whitish or gray color, sometimes showing small red points over a cut surface. The surface when scraped gives off a yellowish, creamy material. The majority of lymph glands will be found affected. The bone-marrow is of a dark red or gray color, and soft consistency. On examination the bone-marrow will be found very rich in white corpuscles.

The liver is enlarged and shows numerous small nodules of lymphoid tissue. The kidneys are enlarged in the same manner. Small nodes will be found throughout the serous membranes, lungs and other tissues in the body.

Symptoms.—The early development of leukemia is usually not observed. Very often the disease is not recognized until the symptoms become prom-

inent and it has reached the advanced stage. The early symptoms are very similar to those of anemia, and the differential diagnosis may be very difficult until decided changes take place either in the blood or lymphatic system. The mucous membranes are very pale or white in color, the animal becomes weak and edematous swellings may appear. The enlargement of the lymph glands comes on gradually and is found involving practically all of the palpable glands. The enlargements vary in size, but stand out in some cases very prominently. The glands are firm, non-painful and well circumscribed or defined. The glands in the submaxillary space, at the pharynx, chest and inguinal regions show most enlargement. The movement of the animal may be interfered with on account of the increase in size of the lymph glands. Respiratory disturbances may be present when the glands become large enough to compress blood-vessels or nerves. Extensive edemas are often present from the same cause. Ascites is a common symptom in dogs from enlargement of the mesenteric glands. The spleen is enlarged but difficult to palpate on account of its position; the enlargement of the abdomen may be the result of the enlargement of the spleen or liver, or both. Percussion of the abdomen may assist in determining the character of the enlargement.

Owing to the involvement of the bone-marrow the animal is lame and shows stiffness and soreness in movement. Pressure on the long bones frequently shows marked sensitiveness and pain.

Characteristic alterations are found in the blood. It appears pale red, or even brown, indicating a reduction in hemoglobin. When allowed to stand and coagulate (which it does slowly) it separates into two layers, the lower consisting of red corpuscles, while the upper is composed of white corpuscles and fibrin. The number of white corpuscles is always increased; in some cases equal in number to the red ones. A decrease in the number of red corpuscles can be demonstrated in most cases. A differentiation may be made between the two forms of leukemia by the blood examination. In lymphatic leukemia the lymphocytes are found increased, while in myelogenous leukemia the leukocytes are found in much larger numbers. Clinically the disease develops gradually, emaciation is more prominent, and more or less extensive hemorrhages occur in the various organs.

Course.—The disease is usually chronic. The acute form is very rare in small animals. The course usually extends over a long period, and complications are common.

Diagnosis.—The characteristic involvement of the lymph glands, spleen and liver, and the increase in the number of white corpuscles, will make the diagnosis comparatively easy. A microscopic examination of the blood is necessary in order to make the diagnosis accurate. The differentiation between the forms of leukemia is determined definitely in this manner.

Prognosis.—Very unfavorable. When the disease is once established there is little hope of recovery.

Treatment.—Owing to the pathological changes present not much can be expected in the way of treatment. In some cases the patient's general condition may be improved by allowing plenty of nutritious food and administering alteratives and tonics. Iron and quinine citrate (0.2 to 0.4 twice daily) have given the best results. Transfusion of blood has proved unsatisfactory in small animals.

PSEUDOLEUKEMIA (HODGKIN'S DISEASE)

Definition.—A disease characterized by a progressive enlargement of the blood-forming organs (spleen, liver, lymphatic glands) and nodular growths in these and other organs. It resembles leukemia in many respects. A notable exception is that the white corpuscles are not increased as in leukemia.

Occurrence.—The disease appears most commonly in dogs, and cats. It is more common, however, in dogs than leukemia.

Etiology.—The true character of the disease is not known. The etiological factors are believed by some authorities to be identical with leukemia. Others are not in accord with this belief.

Pathology.—The lesions found in pseudoleukemia resemble very much those found in true leukemia. Enlargement of the spleen, liver and lymph glands is observed in most cases.

Symptoms.—Progressive anemia and enlargement of the lymph glands are the prominent early symptoms. Examination of the blood will show that the ratio between the red and white corpuscles is nearly normal. Other symptoms are practically the same as in leukemia.

Diagnosis.—A diagnosis can be made only by a microscopic examination of the blood. It should be differentiated from leukemia, malignant tumors and tuberculosis.

Prognosis.—Unfavorable.

Treatment.—Treatment is unsatisfactory. Iron and quinine citrate (0.2 to 0.4 twice daily), or Fowler's solution of arsenic (0.2 to 0.6 once daily) may be tried. Potassium iodide in small doses is also recommended.

HEMOPHILIA

A constitutional defect in which there is a tendency for uncontrollable hemorrhage from slight wounds. It may occur after slight injuries, congestions, or apparently spontaneously. The coagulation of the blood is retarded or absent. Hemophilia is very rare in animals. For further information the reader is referred to other works.

Pathology.—Small hemorrhages are found in the tissues and organs of the body. These are most noticeable under the skin, in the muscles, on mucous and serous membranes, in the joints, liver, spleen and kidneys. Along the margin of the gums will be found distinct ulcerative processes. The gums are dark, almost black, or reddened, and show separation from the teeth. Shreds of the membrane may be removed easily with the forceps. The spleen is enlarged and of a soft consistency. The lymph glands of the mesentery are enlarged and congested. Changes in the blood may leave it thin and pale in color.

Symptoms.—Anemia and emaciation are early symptoms of the disease. The patient becomes very languid, and does not care to exercise or move about. The appetite is suppressed either partially or completely, and the thirst is increased. Marked changes are observed on the visible mucous membranes, those of the mouth showing the most pronounced lesions. The mucous membrane around the margin of the gums becomes discolored, red, later dark bluish-red, and even almost black. Hemorrhages are present in many cases, or the least manipulation of the gums causes bleeding. The membranes become swollen and very sensitive to the touch. The patient when eating will often stop abruptly and show marked pain from the food irritating the involved membranes. Distinct ulcerative processes are observed in the later stages, the gingival membrane becoming separated from the teeth and often the teeth themselves become loose and fall out. Hemorrhages are also found on the conjunctival membranes, in the nasal passages, and under the skin.

Vomiting is a common symptom. The vomited stomach contents are often mixed with blood indicating gastric hemorrhage. Bowel discharges may also contain blood. The disease is progressive and the symptoms increase in intensity until the animal is exhausted or some complication, such as septicemia, pneumonia, or extensive hemorrhage develops.

Diagnosis.—A differential diagnosis is necessary in dogs in order to distinguish scurvy from ulcerative stomatitis. The main points of difference are: (a) the absence of general symptoms and hemorrhages in ulcerative stomatitis. (b) The localization of the condition in ulcerative stomatitis, while in scurvy other parts of the body are affected. In long-standing cases of ulcerative stomatitis the differentiation may be somewhat difficult.

Prognosis.—This will depend a great deal upon the progress the disease has made. If the cause can be removed in the very early stages, the prognosis is more favorable than in cases where the ulcerative processes are well established. When general symptoms of anemia and cachexia are evident the prognosis is bad.

Treatment.—This disease can be readily prevented when a variety of food is allowed and good sanitary conditions prevail.

The early indications in the treatment are to change and regulate the diet. Give the patient nourishing food, such as meat, milk, eggs, etc. Iron preparations (iron and quinine citrate, pulverized iron, saccharated carbonate of iron) are the most satisfactory for the anemia which is nearly always present. Tincture of nux vomica (0.3 to 0.5 daily) or tincture of gentian (0.5 to 0.8 twice daily) is useful as a tonic.

Local applications should also be used. Swab the gums and other

affected mucous membranes of the mouth with tincture of myrrh once or twice daily.

When hemorrhages are present they must be controlled by appropriate treatment.

ANIMAL PARASITES IN THE BLOOD

Several species of animal parasites have been found infecting the blood and circulatory organs in small animals. The dog is most frequently affected. In several districts of the United States, Canada and Mexico, the condition has been reported a number of times. The *Dirofilaria immitis*, *Babesia canis*, *Angiostrongylus vasorum* and the *Spirocerca lupi* are the most important ones found.

Dirofilaria immitis.—This worm, commonly named the heart-worm, is a nematode parasite belonging to the order Filarioidea. It is closely related to the *Onchocerca cervicalis*, found in the ligamentum nuchæ of the horse and to the filarial worms found in the peritoneal cavity of the horse and ox. It occurs in the dog, cat, fox, and wolf and is widely distributed over the world. A recent report from Warsaw, Poland, records the finding of this parasite as far north as that country.



FIG. 15.—Heart and lungs showing mature *Dirofilaria immitis*.

corpuscles. In order to complete the life cycle, the microfilariæ must be taken up by some invertebrate animal. At the present time the following intermediate hosts have been reported: *Aedes aegypti*; *Aedes sollicitans*; *Culex salinarius*; and, *Rhipicephalus sanguineus*. These blood-sucking intermediate hosts take in the microfilariæ in the act of sucking blood from the host. It has been reported that the mosquito species of intermediate host takes in an average of 14.4 microfilariæ in one blood meal. After entering the stomach of the intermediate host, the microfilaria casts its sheath, pierces the stomach wall and migrates to the Malpighian tubules, from which, after a period of about twelve days, it migrates to the labrum of the intermediate host. When the infected intermediate host feeds upon another individual, the larvæ are attracted by the warmth of the body and make their way down the proboscis and crawl on the surface of the host's skin. The larvæ then penetrate the skin at the puncture caused by the intermediate host and pass into the blood stream. From this point until they appear as adults in the heart and adjacent large arteries, there is some confusion as to what actually takes place. It has recently been shown that the microfilaria of *D. immitis* readily pass through lymphatic glands, which is contrary to a view generally held. Augustine and Drinker¹ have recently demonstrated that within one hour after entrance into the blood stream, many microfilariæ may be found in the thoracic duct.

Pathology.—On necropsy the right heart is usually found to be partially or completely filled with the parasites surrounded by a coagulated mass of blood. The endocardium is found more or less thickened and inflamed. The heart is often dilated, the walls thin, and some cases ruptured. Very frequently the lungs show small foci of necrosis, or nodules in the center of which embryos are found. Similar lesions occur in the liver, kidneys, skin and muscular tissues. General anemia is present.

Symptoms.—Various symptoms have been described in connection with the presence of this nematode parasite. Some of the more outstanding symptoms are, difficult respiration, coughing and a tendency to tire easily. Many cases become anemic, emaciated and some may show ascites, edema, and convulsions. Skin lesions are observed in some cases.

Diagnosis.—The diagnosis of heart-worm is largely dependent on finding the microfilaria in the blood stream. The history of the case, along with the symptoms manifested, is of value in diagnosis, but as these symptoms are usually manifested only in the later stages, it is best to base a diagnosis on the presence of the microfilaria in the host.

Three methods may be used in finding the microfilaria. The one more easily performed but less accurate is the examination of a drop of whole blood on a slide covered with a coverslip. The microfilariæ are seen as writhing snake-like forms making their way through the blood cells. This method, while convenient has been shown to be much less accurate than other tests employed.² The other two methods employed depend on the concentration of the microfilaria and the removal of the red cells, thus clearing the field for examination.

A second method is the one described by Morris, Dinkel, and Green³ and is as follows: "Withdraw 1 cc. of blood from a vein and immediately

¹ Trans. Roy. Soc. Trop. Med. Hyg., 29, p. 303.

² Morris, Dinkel and Green: North American Vet., 16, p. 11.

³ North American Vet., 16, p. 9.

add 5 cc. of a 2 per cent acetic acid solution; mix thoroughly and centrifuge three to five minutes; decant the supernatant fluid and place a drop of the sediment on a slide, cover with a coverslip and examine under the microscope. The dead larvæ will appear as small, thin fiber-like structures about $\frac{3}{4}$ inch long and $\frac{1}{16}$ inch in diameter when using a magnification of 100x. The head end is blunt and the tail end is tapered."

A third method is one described by Stubbs and I. Live¹ in which "A blood sample consisting of 2 to 3 cc. is collected with a sterile syringe and placed in a sterile test-tube or vial. The blood is allowed to clot and the serum to separate. A drop of serum is removed by a medicine dropper or glass rod and placed on a slide. A coverslip is dropped over the serum. The coverslip area is covered systematically with the low power and the microfilariae can be plainly seen. When the serum is not examined for some time and there has been a chance for settling, the microfilariae may settle to the bottom. The supernatant fluid may be poured off and the lower layers examined, or the vial may be inverted a few times to make an even mixture of the parasites. The microfilariae are plainly visible in the serum even though inactive or dead, while in whole blood the erythrocytes obstruct the view and motion of all except the very vigorous ones."

Treatment.—The treatment which has been used in infections with the heart-worm is not a specific, but good results have been obtained with the use of a product known as Fuadin (Sodium-antimony III bis-pyrocatechindisulphonate of sodium). Intramuscular injections of this drug are usually made daily for six days, treatment being omitted on the seventh day. The initial daily dose varies from 0.5 to 1 cc., depending on the weight and condition of the host. For each succeeding six-day period, the daily dose is increased by 0.5 to 1 cc., the maximum daily dose varying from 3 to 5 cc. In our experience, the average total dose of the drug required to cause a disappearance of the microfilariae from the blood stream was 35 cc. The largest amount required for any one dog has been 51 cc.

Dogs which are in good condition generally tolerate the course of injections without showing marked unfavorable reactions, while some animals develop severe systemic reactions consisting of a rise in temperature, depression, inappetence, and swellings of various parts of the body. When these symptoms appear, it is best to suspend treatment until they subside and the animal appears normal.

Fuadin may be used intravenously and the period of treatment may be lessened by this method of injection. The method of injection and the rapidity in increasing the dose must be governed largely by the condition of the animal. Some animals do not tolerate this drug very well and it is sometimes necessary to suspend treatment for a period of several days.

Filsol is also being used for the same condition, except it is introduced intravenously. The same dosage is used.

Stibsol, a more recent product is also recommended for the destruction of *Dirofilaria immitis*. It is administered intravenously, and the dosage varies somewhat from fuadin and filsol.

Angiostrongylus vasorum.—This is a fine, thread-like worm infesting the right ventricle of the heart and the pulmonary artery and its branches. The male parasite is about 13 to 16 mm. long, and the female 17 to 20 mm. It forms small nodules in the lining membrane of the vessel wall and thrombi

in the smaller vessels. The female parasite deposits ova which lodge in the finer vessels, which, like the embryos, lead to the formation of small nodes. The larvæ migrate into the bronchi and are coughed up and taken in by other animals.

Symptoms.—The symptoms are mostly those of a progressive anemia and are not characteristic.

Diagnosis.—The diagnosis is only made by finding the parasites on autopsy or the ova and larvæ in the excretions or blood.

Treatment.—Unsatisfactory.

Spirocerca lupi.—(See page 96.)

Babesia canis.—(See page 390.)

CHAPTER 11

DISEASES OF THE THYROID GLANDS

Examination and General Consideration.—Diseases involving these glands are of considerable importance in dogs in which animals all forms of goiter are found. Other small animals are very seldom affected. The two thyroid glands, one on either side of the neck, are situated in the upper third of the cervical region. They are normally small but easily palpable. When diseased they usually grow larger and tend to descend downward toward the thoracic inlet. The position of the diseased glands will vary, therefore, with their size and the breed of dog.

An important thing to be considered in connection with the thyroid glands is the presence of small glandules closely related to them. These glandules are often found in close contact with the thyroid glands occurring in the adjacent tissue or they may be quite a distance removed from them. They consist of small, nodular glands, composed of true thyroid or lymphoid tissue, and are considered accessory glands to the thyroids. Normally they are very small, but usually become much enlarged when the thyroid glands are involved. These small glandules seem to be closely associated with the thyroid glands in function, and will replace to a certain degree the secretions necessary, when the true glands are diseased or destroyed.

CONGESTION OF THE THYROID GLANDS

At or near the time of puberty the glands are often found enlarged; during the estrual periods the same condition is commonly observed. This temporary congestion will disappear in a few days in the majority of cases and the glands assume their normal size and condition. A temporary congestion may also occur from collars being too tight, or dogs pulling on the leash, which disturbs the circulation in the glands. Swelling of one or both glands may result from this and last for several days simulating goiter. As soon as the cause is removed the circulation will return to its normal state and the congestion gradually disappear. Direct injuries to the glands are not uncommon and congestion and edema result. Examination will often reveal the presence of a wound or a contused area. Permanent enlargement of one or both glands may result from injuries, due to fibrous formation.

ACUTE THYROIDITIS

Definition.—An acute inflammation of one or both thyroid glands. This condition has been observed in dogs.

Etiology.—The majority of cases are secondary to other diseases, such as distemper, local infection in the adjacent tissue, or from direct injuries.

Symptoms.—The glands are first noticed to be prominent, enlarged, sensitive on palpation, and the local temperature elevated. In severe congestion the gland will often show pulsation. A differentiation should be made between this condition and the various forms of goiter. The sudden development, local heat, and marked reaction in the glands will assist in making the differentiation. The history of the condition following

distemper or injuries should also be taken into consideration in making the diagnosis.

Prognosis.—The termination of acute thyroiditis is usually favorable. The inflammation subsides and the gland resumes its normal function. Some few cases terminate in a degeneration and suppurative condition which may destroy a part or the whole gland. It is possible also to have the condition become chronic and produce a firm fibrous growth simulating some forms of goiter.

Treatment.—During the acute stage, cold applications should be applied either in the form of cold water or ice packs. This followed by a hot Priessnitz compress and continued until resolution takes place or degeneration and abscess formation occur. Should the function of the gland be disturbed for a prolonged period either potassium iodide in small doses or thyroid extract has proved to be of considerable value. When abscesses occur they should be opened, drainage effected, and an iodine pack applied.

GOITER (STRUMA—BRONCHOCELE)

Definition.—A hypertrophy or enlargement of the thyroid glands which occurs sporadically. It is very frequent in dogs. In some instances goiter is congenital and whole litters of puppies are affected. The enlargement of the glands in these cases may be of sufficient size to interfere seriously with parturition. Very often the glands will be six to ten times larger than normal, seemingly as large as the puppy itself. The lobes and isthmus of the glands are so intermingled that no distinction can be made between them, the whole forming one large mass in the inferior cervical region.

The disease is also acquired in a great many cases, coming on at different periods in the development of individual animals.

Occurrence.—The occurrence of goiter in the various breeds of dogs seems to be in about the same ratio, although in certain districts, pointers, bull-dogs, and bull-terriers, seem to be affected in larger numbers than other breeds.

Many forms of goiter are recognized in dogs, viz.: (a) parenchymatous; (b) cystic; (c) fibrous; (d) vascular; (e) malignant; (f) exophthalmic.

Parenchymatous Goiter.—**Definition.**—A diffuse parenchymatous enlargement of the gland with an increase in the stroma and a collection of gelatinous colloid material in the follicles.

Occurrence.—This form is by far the most common and occurs more frequently in puppies or young dogs.

Symptoms.—The first symptom noticed is the enlargement of one or both thyroid glands. The enlargement may not be equal in both glands. One is frequently much larger than the other. This form of goiter often develops suddenly and the glands assume enormous proportions. Puppies are often born with this particular form or develop it during the first few weeks of their lives. In many cases no marked symptoms of any general disturbance are observed, the animal developing normally except the presence of the enlarged thyroid glands. In other cases, when the glandular secretion is materially interfered with, cretinism and myxedema are prominent symptoms. This is evidenced by marked nervous disturbances and degeneration of the various tissues in the body. The animal becomes emaciated, weak, a mere shadow of its former condition. Young animals

as a result of this glandular disturbance do not develop normally, the head may be larger than normal, and other parts of the body undeveloped, or *vice versa*. Respiratory disturbances often result from the enlarged glands pressing upon the trachea, or from compression of the vagus and sympathetic nerves. The latter condition no doubt accounts for the larger number of cases in which labored respiration and spasm of the glottis are prominent symptoms. Hemiplegia laryngis is produced in a similar manner by pressure on the recurrent nerve. Circulatory irregularities are not so common in parenchymatous goiter. Direct examination of the glands will reveal the enlargement, its smooth regular outline, moderately firm consistency, and absence of local heat or pain. The isthmus of the glands can be palpated, except when the glands are greatly enlarged. In many cases no general symptoms of deranged appetite, elevation of temperature, or cachexia will be noticed.

Diagnosis.—The diagnosis of goiter in general is quite easy, but in some cases it is difficult to make a definite distinction between the various forms. Goiter should be differentiated from abscess, hematoma, and various cyst formations. This can be done as a rule very easily after carefully palpating the enlargement. In order to make a positive diagnosis of the variety or form of goiter present, it is necessary to consider the character of the enlargement, its consistency, the condition and age of the animal. Palpation of the glands to determine their form, whether regular and smooth, or irregular and lobulated, and their consistency, is a very important means of making the differentiation between the various forms of goiter.

Prognosis.—In parenchymatous goiter most cases recover. The glands become smaller until of normal size or near it, and any general symptoms disappear. However, in cases where the glands are enormously enlarged and symptoms of cretinism and myxedema are present the prognosis is not favorable. A recurrence of this form of goiter, while rare, is always probable.

Treatment.—Iodine medication both externally and internally has proved to be of great value. Some remarkable results have been obtained in the rapidity and degree of reduction after its use. For internal administration it has been definitely proved that small doses give the best results. The dose should be regulated somewhat according to the age and size of the animal. One-fourth grain, 0.016 of potassium iodide for puppies, or 0.05 to 0.08 for older animals, given once daily, has given the best results. When given in large doses there is danger of too rapid depletion of the body and paralysis of the heart. These small doses should be continued daily for one to three weeks. For external application colorless tincture of iodine may be applied. Where staining the hair does not matter the regular tincture should be employed. An application can be made daily, or every second day. Thyroid extract (0.15 daily) has been used with excellent results. Surgical interference has not proved successful in relieving this form of goiter. Complete unilateral thyroidectomy might be tried in case one gland is enormously enlarged and the other nearly normal. The operation is performed under general anesthesia and strict antiseptic precautions. The gland is dissected out carefully and multiple ligation of the pedicle is necessary so that the tissue will not retract and allow the ligature to slip off. The gland is then removed about $\frac{1}{2}$ inch from the ligature and

the wound packed with antiseptic gauze for a few days. The ligature is then removed cautiously and the wound covered with an antiseptic dusting powder. It is very important that the wound be kept free from infection during the first few days, and the ligature kept in position to avoid fatal hemorrhage.

Cystic Goiter.—**Definition.**—An enlargement of one or both thyroid glands, characterized by the formation of cysts which may be single or multiple. In cases of long standing, calcification of the cyst wall may take place. The cause of cystic goiter has never been clearly proved. When hemorrhage occurs in the gland follicles they are distended, certain changes in the contents result, and there is left a more or less clear serous fluid. Further, through disturbance in the glandular activity, from injury, nervous influences, or hyperemia, the circulation of the glands is abnormal, leading to extravasation of serum into the follicles which may result in a permanent cystic condition. Cysts commonly complicate parenchymatous goiter.

Symptoms.—An enlargement of one or both of the thyroid glands is the most prominent symptom. Many cases develop rather suddenly while others require considerable time before the glands reach a sufficient size to become noticeable. As a rule, unless complicated with other forms of goiter, no general symptoms will be present. Should the cystic formation involve both glands it is quite possible that the normal function of the glands will be disturbed, then general symptoms will result. Pressure on the vagus, sympathetic, and recurrent nerves may lead to complications as in parenchymatous goiter. In the majority of cases the course of this goiter is chronic, and aside from the unsightly enlargement they produce, the animal will not suffer any inconvenience. Examination of the gland by careful palpation will reveal the soft, fluctuating swelling, the absence of inflammation, and a consistency differing from other forms of goiter.

Diagnosis.—The diagnosis can be made positive by the examination, and if necessary by the use of an exploring trocar to obtain some of the yellowish or clear serous fluid.

Prognosis.—Favorable when proper and prompt treatment is used. Further, as this is in most cases a local condition confined to the gland, remedial measures can be applied more satisfactorily.

Treatment.—This is of two kinds, *viz.*: (a) medical, and (b) surgical.

Medical.—Medical treatment in the form of potassium iodide (0.03 to 0.06) is of value to assist in replacing the loss in the normal secretion of the gland, especially when both glands are extensively involved. Thyroid extract in 0.15 doses daily can be used.

Surgical.—This consists in either aspirating the serous fluid from the cystic follicles and injecting a small amount of Lugol's solution to stop further filling up, or opening the cysts and packing the cavity temporarily with iodine gauze. After-treatment consists in the use of antiseptics. The wound will heal leaving but slight enlargement.

Fibrous Goiter.—**Definition.**—An enlargement usually of one of the thyroid glands (rarely both) characterized by a hypertrophy of the stroma and an atrophy of the glandular tissue. It is most frequent in old animals. This form of goiter results in most cases from injuries, acute and chronic inflammation, and in a few cases no doubt from some of the other forms of

goiter. The interstitial tissue is gradually increased, exerting abnormal pressure on the gland substance, which leads to pressure atrophy.

Symptoms.—The presence of the enlargement confined, in most cases to one gland. Occasionally both glands will be found affected. The size of the enlargement varies greatly from very slight to extreme thickening of the entire interstitial tissue. No general symptoms are observed in the majority of cases as it is confined to one gland and of long standing. When both glands are extensively involved, interfering with their function, emaciation, weakness and general cachexia may be prominent symptoms. Respiratory and other disturbances are only observed when the enlargement presses on the trachea or nerves.

On palpation of the gland it will be found exceedingly firm, resistant, smooth in outline, non-inflammatory, and non-sensitive. The isthmus of the gland is easily determined.

Diagnosis.—This should not be difficult as the outline of the enlargement and the hard or firm consistency, with the other symptoms, are characteristic of fibrous goiter.

Prognosis.—Favorable. Many cases, when not exceedingly large, are not treated as they cause but little inconvenience to the animal. Reduction in the size of the gland is possible, or it can be extirpated.

Treatment.—Injections of iodine into the gland substance have given good results. Inject iodine tincture (2. to 5.) into the gland being careful to avoid introducing the needle directly into a blood-vessel. The needle should be inserted unattached to determine this fact before the injection is made. The injections may be repeated after the acute symptoms subside. It is sometimes necessary to make several applications before reduction is complete. Extirpation of the enlarged gland is recommended when of considerable size and the fellow gland normal. The operation is performed in the same manner as in parenchymatous goiter. When both glands are enlarged and general symptoms of athyrea are present, potassium iodide, or thyroid extract in small doses is recommended.

Vascular Goiter.—**Definition.**—An enlargement of one or both thyroid glands, characterized by dilatation of the blood-vessels without the formation of new glandular tissue, and the absence of any marked general symptoms. This condition is not to be confused with exophthalmic goiter. It is the result of a local dilatation of the blood-vessels supplying the glands and may originate from the same causes as those producing congestion and inflammation of the glands. The exact etiology is not known, but has been observed as a sequel to distemper, prolonged estrual periods, and sexual diseases.

Symptoms.—One or both glands will be found enlarged and engorged with blood. Distinct pulsation of the arteries and even the glands can be seen at a distance. In some cases rupture of some of the vessels results, the blood accumulating in the adjacent tissues, producing an extensive enlargement along the course of the neck. The symptoms, as a rule, subside after a few weeks and may recur at more or less regular intervals. Many cases recover spontaneously. Very little general disturbance is present.

Diagnosis.—The dilatation of the arteries and engorgement of the gland will easily differentiate it from all forms of goiter, except exophthalmic

In exophthalmic goiter, tachycardia, and nervous disturbances when present, should make the clinical picture complete and different from vascular goiter.

Prognosis.—Complete recovery is possible in most cases. In the milder forms it often disappears without any treatment.

Treatment.—An examination of the animal should be made carefully and if any general disturbance is observed it should be treated. Owing to the increased activity of the gland locally, iodine preparations are contra-indicated. Small doses of tincture of opium (0.2 to 0.4 daily) can be tried.

Should the glandular activity become too pronounced, as indicated by hyperthyrea, ligation of a portion of the blood supply to the gland would be indicated. However, in the majority of cases this is not necessary as the symptoms will subside in the course of a few weeks.

Malignant Goiter.—**Definition.**—An enlargement of one or both thyroid glands due to a malignant neoplasm. The malignant growth is either a sarcoma or carcinoma. The growth tends to invade the adjacent tissues and lymph glands, or even to the extent of involving secondarily the lymph glands of the thoracic cavity, the lungs, and other organs and tissues. The condition may become generalized. It is found mostly in old animals.

Symptoms.—The malignant growth may be confined to one gland, but in many cases occurs in both. When the enlargement once begins, its development is quite rapid, and is characterized by an uneven, irregular form of the gland, the presence of acute inflammatory symptoms, very sensitive, and in some cases areas of degeneration and abscess formation are found. Within a short time general symptoms are prominent. Emaciation and general cachexia develop rapidly. The rapidity of its development and the fact that it is usually an old animal affected would assist in making the diagnosis.

Diagnosis.—This is made by careful examination. The characteristic enlargement and condition of the gland with secondary involvement of adjacent lymph glands, together with the general symptoms of emaciation and cachexia, and the age of the animal, should make the differentiation from other forms of goiter comparatively easy.

Prognosis.—Unfavorable.

Treatment.—But little can be expected of treatment. In the early stages, before involvement of the adjacent tissues takes place, extirpation of the gland may relieve the condition for a time but no permanent results can be hoped for.

Exophthalmic Goiter.—*Basedow's Disease. Graves' Disease.*—**Definition.**—A disease characterized by exophthalmos, functional disturbances of the circulatory system, and more or less enlargement of the thyroid gland. This disease is not of frequent occurrence in animals, but is found occasionally in the dog.

Etiology.—The exact etiological factor has been in dispute, but is evidently a pure neurosis as indicated by some of the more recent investigations made. It has also been claimed that it is due to a central lesion in the medulla oblongata. A certain amount of evidence has been produced to partially substantiate this claim. The fact that the primary result of the disease is a hyperthyrea would indicate that it might be a special

involvement of the glands. However, this has not been proved and the best evidence seems to prove the former etiological factor the most likely.

Pathology.—On examination the thyroid glands show enlargement, congestion, the production of newly formed tubular spaces and a collection of mucinous fluid. They show every evidence of hyperactivity.

Pathogenesis.—It is quite important from every standpoint to note that this form of goiter is a primary hyperthyrea while most forms are just the opposite (athyrea). The development of the disease is the result of the increased secretion of the thyroid glands leading to a general toxic condition. The iodothyroidin content of the secretion is greatly increased which no doubt accounts for the intoxication.

From an experimental standpoint much the same condition can be produced in animals by administering large and continued doses of thyroid extract. Further, when thyroid extract or iodine is administered in exophthalmic goiter the condition becomes rapidly aggravated.

Symptoms.—Both the acute and chronic forms have been observed. In the acute form the disease develops very rapidly. The following symptoms are most prominent:

(a) *Exophthalmos.*—A prominence of the eyes which may be unilateral or bilateral. This symptom is readily recognized by the protrusion of the eyeballs, and the prominence of the sclera of the eye. The lids do not cover the eye completely. It is important to note that in some breeds of dogs the eyes are very prominent and this should not be mistaken for exophthalmos. The normal sight is retained in most cases. In severe cases it is possible to have a panophthalmitis which would destroy the sight temporarily or permanently. Ulceration of the cornea is common.

(b) *Enlargement of the Thyroid Glands.*—Some enlargement of the glands is present in practically all cases. The common expression "inward goiter" has been given to this condition when the glands are not much enlarged and the other symptoms are prominent. The enlargement may be general or only one lobe affected.

(c) *Tachycardia.*—The heart action is rapid and the pulse-rate is usually so much increased that it cannot be counted accurately. The action of the heart at first is regular, but during the later stages of the disease becomes very irregular. The throbbing of the heart is often so intense as to shake the animal's body. Acute dilatation of the heart with dyspnea, cough, etc., is a prominent symptom in the later stages.

Distention of the arteries and pulsation of the entire gland is easily seen from a distance. On palpation a distinct throbbing can be felt. The gland may be more or less firm, or soft and flabby, depending on the degree of involvement.

(d) *Tremors.*—Tremors or trembling of the muscles is often observed. General symptoms of restlessness, whining and crying, and spasms are present in some cases. Emaciation comes on rapidly, and general exhaustion is very common.

The chronic form is characterized by similar symptoms but milder in character and lasting for several weeks or months.

Diagnosis.—The diagnosis is not difficult when all the symptoms are taken into consideration. A differential diagnosis should be made from

the other forms of goiter, but aside from vascular goiter this should be easy. In vascular goiter the general symptoms are usually absent.

Prognosis.—Not considered favorable. Some cases recover rapidly under proper treatment.

Treatment.—Owing to the hyperthyrea present, iodine preparations and thyroid extract are contraindicated. The treatment indicated is the reduction of the hyperactivity of the thyroid glands, and regulating the heart action. The hyperactivity of the glands is best controlled by ligation of a portion of the blood supply to them which will immediately stop the function of that particular part and reduce the total volume of secretion. It is recommended that the anterior arteries be ligated. This should be done under strict antiseptic precautions and morphine anesthesia. Immediate good results are obtained in many cases. Extirpation of a portion of the gland is often done in the human subject but is not so practicable in animals. The heart action should be controlled by small doses of digitalis fluidextract (0.1 to 0.2 twice daily), or aconite tincture (0.1 to 0.2 two or three times daily). The animal should be kept in a quiet place. Other conditions arising must be treated accordingly.

PART VI

DISEASES OF METABOLISM

CHAPTER I

DISEASES OF METABOLISM

DIABETES

Definition.—Diabetes is a disease ordinarily characterized by an excessive secretion of urine. It occurs in two forms: (a) diabetes insipidus; (b) diabetes mellitus.

Diabetes Insipidus.—**Definition.**—A chronic disease characterized by the passage of a large volume of urine of a low specific gravity and containing no albumin or sugar. There should be a distinction made between diabetes insipidus and polyuria. The latter is a symptom of some other disease. In polyuria, often confused with diabetes insipidus, the volume of urine passed is not constant. The disease is evidently a functional disturbance of the kidneys in which large quantities of water are voided and equal amounts taken into the system. The solid content of the urine is naturally reduced.

Occurrence.—Diabetes insipidus is not observed very often, but perhaps the larger number of cases is found in dogs. Polyuria is frequently seen in rabbits from improper feeding. Certain foods tend to produce it, which, if continued, may result in a chronic condition resembling diabetes insipidus. There is no doubt that it is often not diagnosed.

Symptoms.—The disease may come on suddenly resulting from irritation to the nervous system or kidneys, or it may be gradual in its development. In rabbits it may develop suddenly after feeding moldy food, etc. Many cases are not observed until the symptoms of anemia and general cachexia are present. Two very prominent symptoms are: (a) copious secretion of urine; (b) intense thirst.

(a) A large quantity of urine is passed each day; in dogs as much as 2 to 4 liters in twenty-four hours, and in rabbits one-fourth the quantity. The urine has a low specific gravity (1.001 to 1.003), is colorless, almost odorless, and voided without any difficulty except when the condition is accompanied by a catarrhal inflammation of the mucous membrane of the urethra or bladder. The urine contains neither albumin nor sugar. Normal solids are very much reduced in quantity.

(b) The animal will show intense thirst; large quantities of water are consumed each day, in dogs as much as 4 to 10 liters. Often animals will show a vitiated thirst and will drink contaminated water or even urine. The appetite is usually normal during the first stages, but gradually diminishes and becomes variable. During the later stages the appetite may be lost entirely, the animal becoming emaciated, and various complications develop. The temperature remains normal until the very latest stages when it may be subnormal.

Course.—When polyuria results from the food it may disappear in a short time following the change in food. This has been observed particularly in rabbits. In cases of real diabetes insipidus the course is chronic, the disease lasting one or two years.

Diagnosis.—A differential diagnosis must be made between diabetes insipidus, polyuria and diabetes mellitus. Polyuria is distinguished from diabetes insipidus by the symptoms disappearing when the food is changed. The symptoms of polyuria are also more variable. Diabetes mellitus is distinguished by the increased specific gravity of the urine and the sugar content.

Prognosis.—While in polyuria the prognosis is usually favorable, in real diabetes insipidus it is bad, the disease terminating fatally after a prolonged course.

Treatment.—An investigation of the food should be made, and if found of poor quality, containing molds or other objectionable substances, it should be discontinued and other foods substituted. Regulation of the diet is an important factor during the early stages of the disease. Limiting the water supply does not have any appreciable effect on true diabetes insipidus, but if it is a simple polyuria it would be well to restrict the patient to a small amount of water.

Medical treatment has not been satisfactory. Small doses of valerianate of zinc (0.2 to 0.4) daily, may be tried; or vasoconstrictors used, such as fluidextract of hydrastis, or fluidextract of ergot. Stomachics and general tonics may be of some value, tincture nux vomica (0.3 to 0.6); once or twice daily.

Clinical and experimental evidence points to orchectomy as a means of relief for this condition when occurring in male animals.

Diabetes Mellitus.—**Definition.**—Diabetes mellitus is a chronic, nutritive disorder in which grape sugar accumulates in the blood and is excreted in the urine. The condition may be permanent or occur periodically. It

is generally considered that in order for a case to be true diabetes mellitus, the sugar eliminated must be grape sugar, and it must extend over a rather long period of time.

Occurrence.—The disease is not very common in animals. A few cases have been found in dogs. The cat and rabbit are very seldom affected.

Etiology.—The exact etiology of diabetes mellitus is not known. It is quite evident that several factors may have to do with the production of the disease. Nervous diseases, especially those of the central nervous system, and diseases of the liver and pancreas probably produce the larger number of cases. The pathogenesis of diabetes mellitus is not quite clear, but the condition may be brought about by a disturbance of the liver or pancreas, in which the grape sugar taken into the body is not converted into glycogen but taken up as grape sugar by the circulation and eliminated in this form.

Pathology.—Many cases present no anatomical changes. There may be hemorrhages in the nervous system, tumor formations, etc. Very often fatty degeneration of the liver is present. The pancreas may be enlarged by connective tissue proliferation and an atrophy of the glandular substance. The other structures show emaciation and evidences of cachexia due no doubt to the chronicity of the disease.

Symptoms.—Until the patient shows emaciation, notwithstanding good appetite, the disease is usually not recognized. The general symptoms are: the animal fatigues easily, becomes dull and listless and does not move about in a normal way, shows increased thirst and appetite. The mucous membrane of the mouth becomes dry, and gingivitis is often present. *The most characteristic symptoms are found in connection with the urinary organs.* The urine is increased in amount, sometimes double the normal quantities voided, is pale, colorless, of a sweetish odor (acetone) and acid in reaction. The specific gravity is increased (1040 to 1060). An examination of the urine should be made to determine the sugar content. From 3 to 5 per cent of sugar has been found. The amount of sugar content will depend to quite an extent on the kind of food given the patient. The feeding of carbohydrates materially increases the per cent while nitrogenous foodstuffs diminish it. (For testing for sugar in the urine, see Diseases of the Kidneys.)

As the disease progresses certain other symptoms are uniformly present. Opacity of one or both cornea (keratitis), or of the lens (cataract) is often found, gradually producing blindness. Other portions of the eye may also be affected. Ulceration of the cornea has been observed. Secondary involvement of the respiratory organs takes place in the form of a catarrhal inflammation of the larynx, trachea, bronchial tubes and lungs. Pneumonia and gangrene of the lungs may develop. Cardiac weakness is noted during the last stages. Other symptoms, such as vomiting, diarrhea and constipation, may be seen. Ulceration of the skin, falling out of the hair, found in some cases, indicate the general disturbance in metabolism. During the last stages the patient becomes very weak, emaciated, cachectic, and dies from exhaustion.

Course.—The disease is characterized by its chronicity and may last from several months to two years. Sugar is sometimes present in the urine for a long time before the disease is recognized.

Diagnosis.—This disease should be differentiated from diabetes insipidus. In the former the presence of sugar in the urine, the gradual emaciation and the retention of the appetite would be sufficient to make a positive diagnosis.

Prognosis.—Is always unfavorable. The disease is a progressive one, in which complications follow each other making the condition hopeless.

Treatment.—Very little can be accomplished except by regulation of the diet and limiting the carbohydrates fed. Dogs should be fed on a diet rich in fats and proteids (eggs, fat meat, or oat meal with fat meat). Large doses of sodium bicarbonate should be given (1.5 to 2.5) daily to reduce the acidosis which is apt to develop. The amount may be increased if necessary. Other alkaline agents, such as Carlsbad salts and ammonium carbonate, may also be administered. Tincture of opium in large doses (0.6 to 1.) once or twice daily is highly recommended as it tends to reduce the amount of sugar. The treatment at least can only bring about temporary relief, and no permanent results can be hoped for.

When occurring in valuable animals or in those to which the owner is strongly attached, insulin may prolong their life for some time.

It is important that the patient be kept quiet and its general strength maintained.

OBESITY

Definition.—An excessive fat accumulation in the body which may be general throughout the entire organism, or confined to certain localized areas, such as under the skin. The condition is very commonly observed in small animals, particularly in dogs. Certain breeds, especially the smaller, are most subject. Castrated animals, especially if castrated after maturity, tend to become obese.

Etiology.—One of the chief factors in the production of obesity is the taking in of larger quantities of food elements than are utilized in the body. Pet animals which are fed highly nutritious foods (candies, cakes, etc.) and are not given sufficient exercise become over-fat. It often happens that an animal will accumulate fat rapidly when only the normal amount of food is allowed. This occurs in most cases from insufficient exercise, the elements taken in not being utilized. The feeding of large quantities of carbohydrates, or restricting the diet to substances containing a large proportion of such elements will bring it about. The temperament of animals no doubt has also some influence. Animals having a phlegmatic temperament tend to become obese through insufficient activity and exercise. Castration of animals changes their disposition, tends to make them phlegmatic and lazy, and therefore fit subjects for the development of this condition. Should animals be castrated before maturity this tendency for obesity is not so noticeable.

Anemia by reducing muscular energy may cause obesity, providing no organic lesion is present and the proper amount of food is allowed. The majority of cases can be ascribed to the hyperalimentation and lack of exercise, rather than any constitutional disturbance of metabolism. Through the disturbance of glandular secretions (thyroid) and its regulation by certain organs (adrenals, pancreas, etc.) oxidation is diminished and constitutional obesity may develop.

Pathology.—No anatomical changes are noted except a general accumulation of fat under the skin, in the muscles, liver, around the heart and other organs. The changes in appearance of the organs and tissue are due to the fatty deposits.

Symptoms.—The condition is characterized by the rapid increase in weight, the change in contour of the body, and in the disposition of the animal. The most common locations of observable fatty deposits are in the panniculus adiposus, neck, shoulders and abdomen. Palpation of the parts will reveal the condition. The animal shows lassitude, fatigues easily, and often shows dyspnea on exercise. This is no doubt the result of impeded action of the organs from the fatty accumulations. Later,



FIG 16—Obesity.

during the progress of the condition, disturbances of other organs and functions will develop. Digestive disturbances are often quite pronounced and the heart action may be interfered with. The mucous membranes are pale, showing anemia.

Course.—The course is chronic. Mild degrees of obesity do not interfere particularly with the animals' health or usefulness.

Prognosis.—Depends a great deal upon the extent of the condition. If the diet can be regulated and restricted, the prognosis is quite favorable. In pet animals, however, it is very difficult to restrict the diet as the owner will invariably break the rules laid down in this regard.

Treatment.—Reduction in the amount of food, systematic and forced exercise are important. At first the reduction in food should be slight but

continuous until only a sufficient amount is allowed to maintain the strength of the patient. The composition of the foodstuffs given is also important. Limit the amount of carbohydrates and fats and allow a greater proportion of nitrogenous foods. A reduction in the amount of drinking water should be attempted.

The medical treatment consists in administering small doses of magnesium sulfate (5. to 12.) daily, or Carlsbad salts (4. to 10.) once or twice daily. Care should be taken to avoid a too severe laxative action over a long period of time.

Thyroid extract is of value in increasing the oxidation of fats. Thyroid extract (0.5 gr.) or iodothyron (0.1 to 0.2) administered once daily has given the best results. The proteid food elements should be increased slightly when these medicinal agents are administered. Complications, should they arise, are given appropriate treatment.

CHAPTER II

DISEASES OF METABOLISM AFFECTING PRIMARILY THE BONES

RACHITIS (RICKETS)

Definition.—A disease of young animals, characterized by impaired nutrition of the entire body and disturbances and changes in the growth of the bones leading to marked deformity.

Occurrence.—The disease is rather widespread, appearing in nearly all countries. Animals in some countries are very commonly affected, while in others the disease is not so prevalent. Young animals, as a rule, become affected during the first few weeks of life, or at about weaning time. The condition is observed more commonly in dogs than in any of the other small animals. Cats and rabbits are not very often affected. It is commoner in the larger breeds of dogs perhaps due to their more rapid growth during early life.

Etiology.—Various factors have been given as the cause of rachitis: (a) due to a deficiency of lime salts in the organism. This is no doubt one of the most important causes of the condition, as it develops most frequently in the breeds that grow rapidly, and at a time in the animal's life when there is apt to be a deficiency in the amount of lime salts ingested. Clinical and experimental evidence tend to prove the accuracy of this statement. (b) Improper assimilation of lime salts due to a lack in the acid content of the gastric juice preventing the lime salts from being dissolved and consequently not absorbed. Foods rich in potassium salts reduce the hydrochloric acid content in the stomach leading to an insufficient solution or absorption of the lime salts. (c) Digestive disturbances (gastric and intestinal catarrh) reduce the amount of lime salts absorbed by increasing the normal elimination of calcium compounds from the intestines. In young animals this condition often occurs at the time of weaning when the character of the food is suddenly changed. (d) Inflammatory conditions of the bones in which the blood-vessels are enlarged and the circulation increased preventing the depositing of the lime salts in the new bone tissue. This process keeps the lime salts in solution instead of being deposited in their normal manner. (e) The possibility of infection having to do with the production of rachitis has been considered, but not proved. Various toxic agents (poisons) will bring about a disturbance in the function of the normal metabolic processes in the body and possibly bring on the condition or predispose to it. (f) Absence of sunlight, dark, damp and unsanitary cellars are no doubt predisposing causes. Heredity has been mentioned also as having some influence in the development of the disease. It is quite evident that the exact etiological factor in the production of rachitis has not yet been determined.

Pathology.—The deformity occurring in rachitis is found mainly in connection with the long bones. The diaphyses of the bones are shortened, softened, become curved. The epiphyses are thickened, more or less spongy, and much enlarged. The bones are much softer than normal and

have the consistency of decalcified bone. They can be cut easily with a knife. The periosteum is thickened, reddened and when removed from the bones may include some of the bone substance. In many cases the interior of the bones is soft and the canal abnormally large. The short bones are found spongy and easily separated. Marked deformity occurs in the skull bones which are often separated. The patient in general will show evidences of malnutrition.

Symptoms.—During the early stages of the disease, before deformity of the bones is present, there are gastric and intestinal disturbances (catarrh), and evidences of malnutrition. Weakness, loss of appetite, diarrhea and tendency for bloating are observed in the early stages. Very often the disease is not noted until the change in the form of the bones begins. Deformity appears in various places. The bones of the head and face show a bulging which gives the animal a peculiar appearance. The limb



FIG. 17.—Rachitis.

Treatment.—The first consideration in the treatment should be the diet. Dogs should be allowed plenty of meat with the addition of ground bone, vegetables, cereals and sufficient milk to moisten the ration. Gastric and intestinal catarrh should be treated, if present, by alkalies and mild laxatives. The lime deficiency must be relieved by the administration of lime salts. Syrup of calcium lactophosphate has been very satisfactory for this purpose (dogs, 8. to 12.). This should be given twice daily and continued for a few weeks. Chalk (calcium carbonate), or calcium phosphate is also to be recommended in doses of 1. to 8. daily. In some cases there will also be a deficiency of phosphorus which can be replaced with calcium phosphate. Phosphorus in a bland oil (dogs, 0.001 to 0.002 in 10. oil) is also recommended. Small doses of hydrochloric acid, well diluted, will assist in the solution and assimilation of lime. Cod-liver oil or viosterol may be given over a short period. When occurring during the winter months treatment with the ultra-violet lamp is indicated.

In dogs, when the limb bones becomes soft and deformed, splints and bandages are useful to act as a support which reduces the deformity to a minimum.

OSTEOMALACIA (BRITTLINESS OF BONES)

Osteomalacia occurs so rarely in small animals that the reader is referred to other works for the discussion of it.

PART VII

DISEASES OF THE ORGANS OF LOCOMOTION

CHAPTER I

THE JOINTS, MUSCLES AND BONES

ARTICULAR RHEUMATISM (POLYARTHRITIS RHEUMATICA)

Definition.—Articular rheumatism is evidently an infectious febrile disease in which several joints are affected. It is a serous or serofibrinous inflammation of the joints. It may suddenly shift from one joint to another.

Etiology.—The actual cause of the disease has never been definitely proved, but all indications point to infection. Several factors no doubt have considerable influence in bringing on the attacks, such as (a) subjection to cold and chilling the surface of the body; (b) keeping animals in cold, damp cellars, or forcing them to sleep out in extreme cold weather; (c) infection following birth of the young. The close association of the disease with endocarditis and other diseases of serous membranes further suggest its infectious nature.

Pathology.—The joint capsule is more or less distended with a yellowish gelatinous-like fluid mixed with the synovia. The connective tissue is infiltrated with the same material. Examination of the synovial membrane itself reveals swelling, injection and hemorrhages. The cartilage of the joint is bluish or yellow in color and the surface roughened. Chronic cases show marked thickening of the periarticular tissue. Similar changes are often found in the tendon sheaths. The musculature shows atrophy.

Symptoms.—The condition often begins suddenly involving one joint or several at the same time. The affected ones are very painful, the animal refusing to place any weight on the limb and holding it in a flexed position. The joints will be hot and swollen. Owing to the pain small animals usually remain in a recumbent position and refuse to arise. The acute symptoms often subside after a week, or ten days, and eventually develop into a chronic inflammation with deformity of the joints. Favorite locations of the inflammation are in the carpal, stifle, and phalangeal joints. In the early stages of the attack there is fever, which may reach 103° to 105° F. The respirations are increased, the pulse double the normal number. The animal refuses to eat in most cases. The urine is reduced in quantity and dark in color.

In the chronic form the disease assumes the character of a serosynovitis; the joint capsule is very much thickened and adhesions take place between the joint surfaces in a number of cases. Ankylosis, however, is rare. There is usually but little fever in this form but general emaciation and cachexia will be prominent. In a few cases complications develop. Inflammation of the serous membranes is the most common. This is indicated by a greater rise in temperature and by the specific symptoms of the complicating condition.

Course.—In the acute form the disease usually runs for two or three weeks. Remissions often occur at different intervals for several months to one year. In many cases the attack disappears quite suddenly which may be for only a short time or permanently.

Diagnosis.—This may be difficult. A careful examination must always be made to differentiate it from other diseases affecting the joints. It should be borne in mind that articular rheumatism comes on primarily while that produced by other diseases shows the primary condition elsewhere before the joints become affected.

Prognosis.—Should not be considered too favorable. Complete recovery, however, may occur in the case of dogs. Very often the condition becomes chronic leading to permanent deformity of the joints. Complications may also follow, such as endocarditis or inflammation of other serous membranes.

Treatment.—Treatment in small animals is often satisfactory by the use of large doses of sodium or strontium salicylate (1. to 2. daily). After two to three days the temperature falls almost to normal and the general condition will improve. Other preparations have been recommended, as salicylic acid (intravenously), salol, or acetanilid. Local applications to the joints will assist in giving relief from the pain, and in the absorption of the deposits. Iodine liniments, camphor oil, or mercuric iodide ointment, any one of which may be applied alternately with hot water applications. The use of the infra-red lamp is also a convenient method for applying heat. The animal should be placed in a moderately warm room, where it is quiet, and provided with a soft bed. In the chronic form massage the joints thoroughly daily with Lugol's ointment. If diseased teeth or tonsils are present which might be serving as foci of infection these should be removed surgically.

MUSCULAR RHEUMATISM

Definition.—A primary affection of the muscles (myositis) probably of infectious origin. It occurs commonly in dogs. Owing to the fact that it is very difficult to make a distinction between muscular rheumatism and so-called "soreness" and "stiffness" of the muscles, they are usually classed as muscular rheumatism. The number of cases of muscular rheumatism would no doubt be decreased if a careful examination were made in all cases and a more accurate diagnosis established. There has been a tendency no doubt to use the term muscular rheumatism in a too inclusive sense.

Etiology.—The immediate cause of muscular rheumatism is probably an infection, the nature of which has not been determined up to the present time. Several factors have to do with the development of the disease: (a) damp, cold kennels, and exposure to cold have proved decided factors in bringing on the attacks. Very commonly observed in hunting dogs following their exposure on hunting trips. This is especially true in those animals that have been pampered and kept in warm buildings and quarters. (b) Ptomaine poisoning and intoxication from toxins absorbed from the intestinal tract will also produce it. (c) Certain infectious diseases of serous membranes will bring on attacks of muscular rheumatism in a similar manner as articular rheumatism. (d) Injuries to the muscles, over-exertion without previous exercise, will produce similar symptoms. This, however, should not be classed as muscular rheumatism.

Pathology.—On examination the muscles will show serous inflammation with infiltration of the intramuscular connective tissue. Disintegration and fatty degeneration are found in most cases. The muscular tissue shows evidence of hyperemia and swelling. In chronic cases the fibrous connective tissue elements are thickened.

Symptoms.—Pain is always a prominent symptom. This may be constant in severe attacks or in the milder forms periodic and recurrent. In dogs the condition very often comes on suddenly without any prodromal symptoms. The attack is usually transient lasting from a few hours to several weeks, and is very apt to recur. The symptoms of muscular rheumatism will depend somewhat upon the groups of muscles affected. Sometimes the muscles of the head and neck are involved; in this case the head and neck will be more or less fixed, the animal holding the head in a rigid position. When manipulated or the animal made to move indications of severe pain are noted. In other cases the muscles over the scapula will show the primary seat of the disease. This is often unilateral, but may be present on both sides. The anterior limb will be relaxed or the animal show marked lameness when weight is placed on it. When bilateral the animal may be found in a recumbent position, with the limbs straightened out, and will refuse to get up. The patient cries and whines when the muscles are palpated.

In involvement of the muscles of the back (*lumbago rheumatica*) the animal assumes a rigid attitude, very cautious in all its movements, frequently refusing to move and when forced to do so great pain is manifest. Occasionally the patient will be found lying down. Manipulation of the muscles over the region produces intense pain. When the muscles of the extremities are primarily affected the animal lies on its back with the feet upward, whining and crying. Feces and urine are often retained when the abdominal muscles are affected. The various functions of the body are interfered with owing to the pain from the disease. The skin is either normal or hypersensitive. As a rule no appreciable rise in temperature is noted. The respirations are increased and may be shallow when the respiratory muscles are affected. The pulse may be increased materially, due to the pain present. The general condition of the animal is good and the appetite retained. In severe cases animals become emaciated from the disturbance of the functions. Complications occur occasionally in the form of acute inflammation of serous membranes, and disturbances in the digestive tract.

Course.—The acute attack, as a rule, lasts only a few days to one week. The symptoms may disappear entirely. Recurrence of the condition is to be expected.

towels applied to the affected area often give relief promptly. Internally, administer sodium salicylate, strontium salicylate or salicylic acid in large doses (0.9 to 1.5) once daily. When the pain is intense it is advisable to control it by subcutaneous injections of morphine sulfate (0.1 to 0.2). This may be repeated in twelve to eighteen hours if necessary. Complications as they arise should be treated. In cases that tend to become chronic, potassium iodide is highly recommended (0.2 to 0.4). Plethoric animals should be depleted by administering saline laxatives (magnesium sulfate 8. to 12.).

FRACTURE OF BONES

As a result of injuries from various causes small animals are particularly prone to fractures of different kinds. The number of fractures and the bones affected are much greater than in the large animals. All kinds of fractures (partial, complete, compound, or comminuted) are observed. The larger number of fractures naturally take place in the extremities, although fractures of the skull bones, inferior maxilla, ribs and vertebrae are not uncommon. The causes of fractures are varied, but the greater number of cases result from traumatism (being run over by vehicles, kicks, falls, jumping, gunshot wounds, bites from other animals). In a few cases extreme muscular contraction will fracture the bones. Various diseases of the bones and senility predispose to fractures. Where fractures are suspected the fluoroscope or roentgen-ray should be used. Such aids can also be utilized during or following reduction. The following are the more common fractures:

Cranial Bones.—This form of fracture occurs occasionally in dogs. The writer has observed 6 cases during the past twenty years.

Etiology.—Practically always results from traumatism. Being struck by sharp or blunt objects, run over by automobiles, kicks, etc., are the most frequent causes.

Symptoms.—Various kinds and degrees of fractures are recognized, from a simple fissuring of the bones to penetrating, depressed or compound comminuted fractures. The symptoms vary with the degree and kind of fracture. Simple fissuring of the bones may not produce any marked symptoms unless the concussion has been sufficient to cause hemorrhage or injury to the membranes of the brain. The presence of the wound and, on pressure, slight movement between the bones may be observed. Penetrating wounds with fracture often produce complications of hemorrhage into the cranial cavity or direct injury to the structures within. Examination of the external wound and carefully probing will at once disclose the actual condition. Fractures with depression of a fragment of bone cause

many instances when the brain is severely injured or sudden severe hemorrhage takes place. Careful examination should be made in all cases in order to establish a positive diagnosis.

Prognosis.—The prognosis should not be considered too favorable on account of the danger of brain complications.

Treatment.—The treatment will depend upon the kind of fracture. In simple fissuring of the bone no treatment is necessary, except for the contusion of the skin and muscular tissue covering the bone. Penetrating fractures are best treated by opening the external wound, examining the fractured portions and elevating them carefully with a scalpel or stiff probe. Clean the wound thoroughly and suture the skin covering it with iodoform collodion.

Depression of the skull bones should have prompt treatment to relieve the pressure from the brain and membranes. This is best done by making external incision, and if necessary a small opening through the bones so that an instrument can be inserted to elevate them to their normal position. Strict aseptic precautions should be observed in the operation. Suture the outside wound. In compound comminuted fractures all fragments of bone should be removed, conserving as much as possible, and a protective dressing applied to the parts.

tion of the parts are prominent symptoms. Should the fracture be confined to the lateral processes no other symptoms will be observed. In complete fracture of the cervical vertebræ with involvement of the cord, death may result in a few minutes, or hours. Complete paralysis exists posterior to the point of the fracture. Fracture in the lumbar region produces paraplegia and paralysis of the posterior portion of the body. Differentiation between hemorrhage in the canal, edema of the cord and fractures is often difficult and can be determined only by the progress of the case. Fractures of the coccygeal vertebræ are easily determined by crepitus and the increased mobility of the parts.

Prognosis.—Complete fracture of the vertebræ is unfavorable. Fracture of the lateral processes or coccygeal vertebræ is favorable.

Treatment.—No treatment is possible in fracture of the cervical and lumbar vertebræ. The animal should be placed in a quiet, comfortable place and given nourishing food. If necessary artificial feeding should be carried out. Laxatives are also necessary. Simple fracture of the coccygeal vertebræ is best treated by bandaging. If complications arise or a compound fracture is present amputation may be necessary at the point of fracture, or slightly above.

Fracture of the Ribs.—This is found most commonly in dogs and is of very frequent occurrence.

Etiology.—Produced in many cases by being run over by vehicles, struck by objects, or kicked.

Symptoms.—One or two ribs may be fractured without producing marked symptoms. This is especially true in partial and in simple fractures. Some will show displacement and enlargement at the point of fracture. Crepitus is hard to distinguish in all patients. Compound fractures may cause injury to the pleura or lung tissue. Examination should be made carefully.

Prognosis.—Favorable unless complications involving the pleura and lungs develop.

Treatment.—Most cases do not require any treatment. Keep the animal quiet. A bandage applied around the thorax to assist in keeping the parts fixed might be used. Complications involving the pleura and lungs should be treated according to the conditions.

Fracture of the Scapula.—This is not of frequent occurrence. In dogs the points of fracture most common are through the neck and glenoid cavity. In young animals separation takes place frequently between the epiphyses and diaphyses.

Etiology.—From injuries and diseases of the bones.

Symptoms.—Sudden development of lameness. The limb usually hangs inert and cannot be moved upward and forward. Examination will reveal the fracture.

Treatment.—No satisfactory treatment can be applied owing to the

end of the bone is more often fractured than any other portion. Fracture of the condyles occurs with considerable regularity.

etiology.—Traumata of various kinds produce the majority of cases. It occasionally happens that both the humerus and scapula are fractured at the same time.

symptoms.—When unilateral fracture of either the epiphyseal or diaphyseal portions of the bone takes place the animal cannot support any weight on the limb. It will hang free and limp. Should both be fractured the animal rests its weight on its haunches, or assumes a recumbent position.

diagnosis.—Examination of the limb will at once make the diagnosis definitive. It is very rare to find a compound fracture.

prognosis.—Favorable.

treatment.—The application of bandages is very difficult. This is especially true when the fracture occurs in the upper portion of the bone. Experience has proved that good results follow without splints or bandages. Occasionally a false union of cartilage or fibrous connective tissue will be formed forming a pseudo-articulation. If bandaging is attempted it may be accomplished by binding the limb to the body, being careful to get the bone in the proper alignment. Various types of mechanical devices have been developed such as metallic splints, rods, etc., for the reduction of fractures of the limb bones.

Fracture of the Metacarpal and Phalangeal Bones.—These bones are fractured from the same causes as mentioned under the others.

Diagnosis.—This is made by careful palpation.

Treatment.—Bandage as in fracture of the radius and ulna. In compound fractures it is sometimes necessary to amputate a portion of the limb or toes.

Fracture of the Pelvis.—Fracture of this bone is quite common in small animals, and presents a variety of conditions. The most common points of fracture are through the symphysis, external angles of the ilium, or through the acetabulum. Both unilateral and bilateral fractures are observed. Complications are common following fractures of the pelvis, owing to the injury of adjacent structures. Injury to the nerves or blood-vessels is most common.

Etiology.—Pelvic fractures are produced very frequently by being run over, struck by objects, kicks, or falling.

Symptoms.—The symptoms will vary somewhat depending on the degree of fracture, its location, and the complications. Deformity of the pelvis is present in fracture of the external angle of the ilium. Crepitation and movement of the parts can be detected. Fracture through the symphysis is evidenced by the unnatural gait of the animal, the abduction of the limbs, and the separation which can be detected on palpation between the fractured portions. It is sometimes difficult to make a positive diagnosis in fracture at other points on account of the smallness of the opening through which the examination must be made. Complicating symptoms should be considered in all cases.

Prognosis.—Unless complications of hemorrhage and destruction of some of the nerves occur, the prognosis is considered favorable. Different degrees of deformity will be met with which should be considered in the prognosis. The condition is serious in breeding animals on account of the deformity narrowing the pelvic canal. Such animals should be given a careful examination in this regard.

Treatment.—But little can be done in the way of treatment. Union usually takes place promptly by giving the animal protection for a few weeks. Various methods have been tried to approximate fractures of the pelvis but with little success. In cases where there is extreme abduction of both limbs, healing may be hastened by holding the limbs in their normal relation by the use of a bandage extending from one limb to the other.

Diagnosis.—Fissuring of the bone may present some difficulty but in other cases the diagnosis is easy.

Prognosis.—Favorable. Union of the bones may result in some permanent distortion, such as shortening the limb, or a certain amount of angularity.

Treatment.—An attempt should be made to bandage the limb to keep the bones in apposition as nearly as possible. A temporary muslin and splint bandage should be used until the swelling subsides. Later a better and more permanent dressing may be applied. As a rule union takes place quite promptly and without much distortion.

Fracture of the Patella.—This bone is very rarely fractured in small animals. Careful palpation over the region would reveal the condition. No treatment other than bandaging can be applied.

Fracture of the Tibia and Fibula.—These bones are the seat of all types of fractures. Very common in dogs and rabbits. The symptoms, prognosis and treatment are similar to those given for the radius and ulna.

Various types of mechanical devices have been developed such as metallic splints, rods, etc., for the reduction of fractures of the limb bones.

CHAPTER II

DISEASES OF THE ARTICULATIONS

THE various articulations in small animals are subjected to a variety of conditions.

WOUNDS OF THE ARTICULATIONS

Punctured wounds and various kinds of incised wounds are frequently encountered. In some cases the adjacent structures may be severely injured complicating the condition. Further classification should be made into aseptic and septic wounds. From a practical standpoint it is important to examine the wounds carefully to make these distinctions.

Etiology.—It is self-evident that these wounds occur through various accidents and injuries to which the animals are subjected.

Symptoms.—The animal will favor the joint affected and refuse to walk on the limb. A thin, serous discharge (synovia) is noted coming from the wound. The amount of pain and swelling will not be marked in the early stages. However, if infection is introduced, these symptoms develop very rapidly. Pus soon makes its appearance, the joint becomes very hot and sensitive, and general symptoms of fever and loss of appetite, are observed.

Diagnosis.—This is made by carefully examining the discharge and by probing the wound with a sterile probe.

Prognosis.—Should not be made very favorable in any case, owing to the possibility of destruction of the joint, or ankylosis. Non-infected wounds usually heal without difficulty.

Treatment.—After learning the facts concerning the involvement of the joint, strict antiseptic precautions should be taken, and all means employed to prevent infection. Shave the hair from the area and disinfect the surface with bichloride of mercury and glycerin (1 to 500). Saturate gauze or cotton with this solution and apply under a bandage, if possible. When infection is already present it is advisable to open the wound so that adequate drainage will be brought about. Use the same solution as above and inject it into the articulation. Apply a protective dressing. Repeat this treatment at least twice daily. Some degree of success has been obtained in such cases by the proper use of the ultra-violet lamp.

SPRAINS AND INJURIES TO THE ARTICULATIONS

In the larger number of injuries occurring in small animals it frequently happens that the structures around the joints are torn or otherwise injured without an external wound. This condition may occur in any of the articulations. As soon as the injury occurs the synovial secretion is increased in amount, and the adjacent tissues are often edematous.

Symptoms.—This condition develops suddenly following injury, or violent exercise. The articulation soon becomes enlarged, very hot and painful to the touch. The patient refuses to bear any weight on the limb. Careful examination must be made to differentiate sprains from fracture or dislocation. Distortion, increased movement, and crepitus found in

fractures are absent in this condition. The normal position of the bones would exclude dislocation. In severe cases the swelling may be so extensive as to interfere with making a positive and early diagnosis.

Prognosis.—Most cases of sprains recover.

Course.—The course depends upon the degree of injury.

Treatment.—The animal should be confined in a quiet place for several days. Cold applications in the form of cold water, or better, ice packs, should be applied during the first twenty-four to thirty-six hours. The packs are changed frequently to keep up the refrigeration. Follow this treatment with hot water, or liniment (iodine liniment, white liniment) applied once or twice daily. Massage the parts thoroughly. The latter treatment should be continued for two to three weeks, if necessary. Heat as produced by the use of the infra-red ray lamp is indicated in such cases.

DISLOCATION OF THE ARTICULATIONS—LUXATION

Dislocation of the various articulations in dogs, cats and rabbits is a common occurrence and may be determined by use of the fluoroscope or roentgen-ray.

The following are the most common dislocations found in small animals:

Temporomaxillary.—This occurs more frequently in dogs than in any other animal.

Etiology.—Resulting in most cases from extreme opening of the mouth, either from being forcibly pulled open, or from large objects being taken into the mouth. The condition may be either unilateral or bilateral.

Symptoms.—Fixation of the lower maxilla either laterally (in case of unilateral luxation), or downward and forward (bilateral luxation). Saliva flows from the mouth freely, the animal is unable to move the maxilla, or only slightly, and shows considerable anxiety and pain. Pawing at the mouth with the forefeet, rubbing the parts against objects, and carrying the head in abnormal positions, are prominent symptoms. Patients showing these symptoms should be handled carefully, as in some respects they are not unlike dumb rabies. Examination will easily reveal the differential features.

Prognosis.—Usually favorable, except when the case is of too long standing and fracture of the bones is present. There is always the possibility of a recurrence.

Treatment.—Reduction of the dislocation should be made early. The animal should be anesthetized (morphine sulfate, 0.1 to 0.2; or nembutal), placed on a suitable table in the dorsal position, and by using a fulcrum inserted between the teeth, the jaws are forced apart by bringing the incisors together. By careful manipulation the bones are replaced in their normal position. Considerable patience is often necessary to accomplish this. If fractures are present but little can be done. Use artificial feeding of liquid foods for a few days. It is advisable to tape the mouth shut for a few days until the articulations are normal again.

Vertebral.—Dislocation unattended by fracture is rare. The articulations are so arranged anatomically that luxation without fracture is not liable to occur. Partial luxation is met with occasionally and is diagnosed by the position of the head and curvature of the vertebrae. Straightening the head and neck should be attempted.

Scapulohumeral.—Owing to the position of the articulation and its anatomical structure complete luxation is not common. The articulation is capable of rather extensive movement without dislocation.

Etiology.—It is brought about by excessive flexion of the joint from injuries and accidents. The luxation is usually forward and inward.

Symptoms.—The condition occurs suddenly and distortion of the joint is apparent at once. The joint is held in a flexed position and distention is practically impossible. The limb is much shorter than normal. Examination of the articulation reveals the head of the humerus forward producing an enlargement anteriorly and a depression posteriorly. Animals show pain on manipulation of the joint.

Prognosis.—In complete luxation the prognosis is favorable when taken early but later when swelling takes place reduction is difficult, and the joint capsule will rarely resume its normal condition. Partial luxations are favorable.

Treatment.—The animal should be anesthetized (morphine sulfate, 0.1 to 0.2; or nembutal), placed on the table in lateral recumbency with the affected articulation presented. Extend the humerus and push backward on the head of the humerus. Usually replacement will take place without much difficulty. Apply a bandage for a few days to protect the part. Massage and a stimulating liniment should be applied around the joint.

Humero-radio-ulnar.—Luxation of this articulation may be partial or complete. Various conditions can be found owing to the anatomical structure of the joint. The dislocation may be between the humerus and radius or between the radius and ulna. In some cases all of the structures are involved. The dislocation may take place to the inside or outside depending upon the cause of the condition. When dislocation occurs there is nearly always a tearing or stretching of the ligamentous attachments around the joints. A congenital dislocation is sometimes observed.

Etiology.—The condition is brought about by injuries, such as blows from the outside or inside, extreme flexion or extension of the joint, falling, or jumping. Frequently the limb is given a sudden twist by the foot being caught when the animal is in motion, or pulling backward to free itself.

Symptoms.—Distortion of the articulation is noted, and the lower limb in an abnormal position, either abducted or adducted. There is an enlargement present on one side and a corresponding depression on the opposite. The limb appears short, and the animal refuses to place any weight on it when in motion or at rest. Examination reveals the joint to be hot and painful when manipulated. The displaced bone can easily be palpated, and the luxation determined.

Prognosis.—Not very favorable owing to the injury to the annular liga-

Radio-ulnar-carpal.—From violent injury luxation of this articulation may take place. The annular ligaments become torn allowing the articular surfaces to be displaced.

Symptoms.—Distortion of the articulation either forward or backward is most common.

Diagnosis.—The diagnosis is not difficult when a careful examination is made.

Treatment.—Reduction of the luxation is easy, but it requires several weeks before the animal will be able to use the limb. Protect the joint by placing a pad of cotton under a bandage. Keep the bandage on for two or three weeks.

Phalangeal.—Dislocation is very common and results from traumata. A careful examination should always be made to differentiate luxations from fractures, and to definitely determine the joint displaced. They should be reduced as early as possible and a bandage applied. Keep the bandage in position for two to three weeks.

Coxo-femoral.—This is one of the most common dislocations in dogs, cats and rabbits. It may be partial or complete. When partial the damage is mainly in connection with the capsular ligament, while in complete luxation the entire joint structure and the adjacent tissues are involved.

Etiology.—Being struck by objects, run over by vehicles, and having the foot caught in traps, etc., are the most common causes. Extreme extension of the limb from any cause may bring it about.

Symptoms.—The most frequent form of luxation is forward and upward. The animal is found with the limb fixed in a backward, adducted position, and refuses to place any weight on it. An enlargement will be noted just anterior to the normal position of the joint, and on palpation the head of the femur can be felt. Manipulation of the limb will at once reveal the condition. Luxation into the obturator foramen is not common but occurs in a small percentage of cases. The limb appears longer than normal, is slightly abducted, and the stifle joint is turned outward. Adduction of the limb is difficult and impossible to the normal degree. Palpation of the parts will easily diagnose the condition.

A backward, upward luxation occurs occasionally and the position of the limb is forward and inward, with an enlargement present on the posterior aspect of the joint. Careful examination will determine the relationship of the parts. In partial luxation the animal is able to move the limb and shows lameness but very little deformity. Chronic conditions become accommodated to the movements of the animal through the formation of a pseudo-articulation.

Prognosis.—Rather unfavorable for a complete recovery. Early cases are much more favorable than those of a few days or weeks standing.

Treatment.—Treatment should be applied as early as possible. Anesthetize the animal and effect replacement by manipulation of the limb according to the character of the luxation. The principle involved is to extend the articulation in whatever direction is necessary so that the head of the femur can be returned to the acetabulum. Very little can be done in after-treatment except keeping the animal quiet for several days. Mechanical appliances to hold the bones in position have not proved satisfactory. Little can be expected in the treatment of chronic cases.

Patellar.—This occurs most frequently in the dog. The ligaments of the patella are not very well developed except the middle one. Therefore, displacement is more liable to occur medially or laterally. Experience has shown that medial displacement is by far the most common.

Etiology.—The anatomical structure of the patellar ligaments and the joint in particular make displacement easy from excessive exertion or injuries. In some breeds the internal femoral ridge of the patellar groove is very small; therefore internal displacement is of common occurrence.



FIG. 18.—Bilateral luxation of the patella.

Symptoms.—The limb is held in a flexed position, and the patient has difficulty in supporting weight. The flexion is most apparent at the stifle joint. The position of the limb is somewhat characteristic, the stifle joint adducted, the hock rotated outwardly, and the lower portion of the limb carried toward the median line. Examination of the stifle joint will reveal the misplaced patella. When the condition is bilateral the animal will show a crouching attitude, and will have considerable difficulty in maintaining the standing position. The animal moves with great difficulty in bilateral dislocation.

Prognosis.—The prognosis should not be considered favorable owing to the difficulty in keeping the parts quiet and the possibility of a recurrence of the condition. Very often there is a tendency for the condition to become chronic.

Treatment.—Replacement of the patella presents very little difficulty; therefore the problem of keeping the patella in position until the ligaments

assume their normal condition is to be the principal aim in treatment. Replacement is affected by extension of the joint which will allow the patella to be pulled back to its normal position. Apply linen bandage in order to retain the parts in their normal position. The animal should be kept quiet for several days. A plaster bandage might be used to advantage. Reduction is brought about and Lugol's solution injected to produce swelling in an attempt to fix the patella in normal position.

Tibio-tarsal.—This is not very common in small animals. When it does occur it is accompanied by rupture of the ligaments or fracture of some of the bones. A careful examination should be made to determine the conditions as accurately as possible. Linen bandage should be applied for the first few days, followed by a plaster bandage if necessary.

Caudal Vertebrae.—The larger breeds of dogs with long tails (Great Dane, greyhound, etc.) are the most frequent sufferers. Examination of the parts will reveal the condition. A bandage applied rather firmly and kept in position for several days will correct the dislocation.

INFLAMMATION OF THE SYNOVIAL MEMBRANE AND ARTICULATIONS (SYNOVITIS—ARTHRITIS)

Definition.—An inflammation of the synovial membrane and articular surfaces. The conditions may be acute or chronic. Very often the entire joint will be inflamed (synovitis and arthritis). It is very difficult to make a distinction between these two conditions.

Etiology.—Most cases result from sprains and contusions of the joint. Few result from infection (pyogenic). The infection usually gains entrance through wounds of the synovial membrane.

Symptoms.—Enlargement of the joint, extreme sensitiveness, and increased local temperature are characteristic symptoms. The animal cannot use the limb to any extent. Examination should be made carefully to differentiate it from articular rheumatism.

Prognosis.—Favorable in cases resulting from sprains and bruises; unfavorable in infected joints.

Treatment.—During the early stages of the condition cold applications are applied either in the form of cold water or ice packs which should be carried out conscientiously if the best results are to be expected. This treatment may be followed by hot applications and liniments (soap liniment, white liniment, iodine liniment). During treatment the animal must be confined to ensure rest to the affected joints. In case pus is present in the articulation, it should be opened and antiseptics directly injected. (See Wounds of Joints.) Chronic cases are not amenable to treatment.

PART VIII

DISEASES OF THE URINARY SYSTEM

CHAPTER I

DISEASES OF THE KIDNEYS

Examination.—Examination of the kidneys consists of abdominal palpation, direct inspection and exploration, and examination of the urine.

(a) Abdominal palpation is best done with the animal in a standing position, using the fingers of both hands. By gentle digital pressure, abnormalities in the dimension and location of the kidneys will be noted. This method of examination will prove satisfactory only in cases where a marked enlargement occurs, or in emaciated animals or cats.

(b) Direct inspection of the kidneys may be made, especially in dogs, by performing laparotomy under anesthesia (see Laparotomy). This method can be done safely and will be found useful in determining accurately the size, consistency, and location of the kidneys. In cases of cysts or other enlargements an exploring needle may be used to obtain some of the contents for examination.

(c) The examination of the urine should be made chemically and physically. Chemical tests should be made for albumin and sugar. The tests for albumin are made as follows: Heller's ring test is a very valuable one as a very small percentage of albumin can be demonstrated with it. It is made in the following manner: a small amount of urine is filtered, and poured into a test-tube containing concentrated nitric acid. At the point of contact of the two liquids a well defined white ring forms, the depth of which depends upon the amount of albumin present.

The boiling-point may also be used. Take a few cubic centimeters of urine in a test-tube and heat to boiling, acidulate by adding 5 to 10 drops of concentrated nitric acid. A precipitate which has been formed by earthy phosphates or carbonates will then dissolve, but one due to coagulated albumin remains.

The metaphosphoric acid test is made by adding an aqueous solution of metaphosphoric acid to the urine. The urine becomes cloudy in case albumin is present.

The acetic acid-ferrocyanide of potassium test is made by adding 2 per cent of acetic acid to the urine and then a 5 per cent solution of ferrocyanide of potassium, the latter drop by drop avoiding an excess. If albumin is present a decided turbidity or flocculent precipitate appears.

The quantitative determination of albumin is made with Esbach's albuminometer. Acidulated urine is filled into the sign U, the reagent up to R (1 part of picric acid, 2 parts of citric acid, and 100 parts distilled water), the tube is closed with a rubber stopper and slowly turned over several times without shaking; let stand at room temperature for twenty-four hours, after which the results may be easily read.¹ The figure indicates

¹ Fish, Pierre A.: "Urine of the Horse and Man," page 51

the proportion of albumin in grams per mille. Urine containing a large percentage of albumin must be first diluted with water and the indicated figure must then be multiplied with the figure of the dilution to obtain the exact amount of albumin present.

When it has been demonstrated that albumin is present in the urine, then it must be determined whether the albumin originates from the kidneys, from the urinary passages, or from the nearby genital organs. If the urinary sediment contains no organic form elements, or form elements derived from the kidneys, and if the presence of dissolved coloring matter of the blood may be excluded, then it is positive that it is renal albuminuria. If there is a large amount of organic sediment then it is not likely to be renal albuminuria. In some cases it is possible to have a mixture, coming from the kidneys and also from other parts of the urinary system.

The chemical test for sugar in the urine is best made by using Trommer's test, which is as follows:

A few cubic centimeters of urine are put into a test-tube, after removing any albumin which might be present, dilute it with an equal volume of water, render it alkaline with a small quantity of sodium hydrate, then add drop by drop a 4 per cent solution of copper sulfate until the liquid is clear and the sediment dissolved, then heat until it boils. If sugar is present, a reddish-yellow vapor appears at the surface of the fluid. The bismuth test is often used for the same determination. The albumin is removed from 10 parts of urine and added to this is 2 parts of subnitrate of bismuth, 4 parts of Rochelle salts, and 100 parts of a 10 per cent solution of sodium hydroxide. This mixture is boiled for five minutes. It becomes black if sugar is present.

To determine the quantity of sugar present the saccharometer is used. The urine is fermented by adding a small quantity of yeast. Graduated glass tubes or other apparatus are necessary to determine the exact quantity of sugar present.

Physically the urine varies in color and amount, depending a great deal upon the kind and amount of food, the condition of the kidneys, and the species of the animal.

CONGESTION OF THE KIDNEYS (HYPEREMIA)

This condition is divided into two forms, viz.: (a) acute hyperemia (arterial hyperemia), (b) passive hyperemia (venous hyperemia).

Acute Hyperemia.—**Etiology.**—The causes of this condition are usually the same as those producing acute nephritis, irritating foodstuffs, chemicals and various diuretic compounds, are the most common things producing acute hyperemia. It may occur during the course of infectious diseases (distemper, rabies). Plethoric animals frequently have active hyperemia of the kidneys.

Pathology.—The kidneys are enlarged, swollen, softened and highly reddened. The arteries and capillaries are found distended. Small hemorrhages appear under the capsule. The capsule is easily removed.

Symptoms.—This condition may not produce very marked symptoms. The most noticeable is the increased amount of urine, the specific gravity of which is much lower than normal. Sensitiveness over the region of the kidneys, and stiffness in walking are also common symptoms.

Prognosis.—Depends upon the cause. There is always danger of the condition resulting in an acute inflammation of the kidneys.

Treatment.—Acute purgation is indicated. Administration of magnesium sulfate, or calomel to remove the waste material through the bowels. Avoid irritating foodstuffs. Give milk for a few days. The cause should be removed if possible.

Passive Hyperemia.—**Etiology.**—This condition is brought about as a secondary disease following valvular defects, diseases of the lungs, pleura, etc. In some cases it is produced by pressure on the renal vessels by tumors, etc. In all instances the circulatory disturbances lead to an engorgement or passive congestion of the kidneys.

Pathology.—In passive hyperemia the kidneys are of a dark bluish-red color, larger than normal. On cut section the venous blood oozes out. In old cases there will be found considerable connective tissue thickening.

Symptoms.—In this condition the quantity of urine is decreased, and albuminuria is present.

Prognosis.—Depends upon the primary condition.

Treatment.—**Medical.**—Digitalis administered in small doses daily. Animals should be given gentle exercise. Give nourishing food which is non-irritating (milk and eggs).

INFLAMMATION OF THE KIDNEYS (NEPHRITIS)

Acute Nephritis.—**Definition.**—An acute inflammatory condition of the kidneys, which is characterized either by nutritional disturbances of the renal epithelium with only a slight change in the interstitial connective tissue (parenchymatous nephritis), or an involvement of both the renal epithelium and the interstitial tissue without the formation of a purulent exudate (nephritis acuta diffusa).

Etiology.—This disease is quite common in small animals in which it frequently develops from infectious diseases and poisons.

Acute nephritis occurs secondary to infectious diseases. The organisms circulate *via* the blood stream, become lodged in the glomeruli and in the intertubular blood-vessels, and at the point of lodgment injure the tissues. In this way the disease occurs during the course of distemper, septicemia, etc. Bacterial toxins in passing through the cellular elements of the kidneys, produce in them and the blood-vessel walls certain degenerative processes, which eventually lead to an acute inflammation. The bacterial toxins probably produce the disease in the majority of cases, as the absorption of toxins takes place in a number of conditions, such as in diseases of the alimentary tract, diseases of the peritoneum, etc., and in this manner we may account for the development of acute nephritis during or following such diseases. In like manner acute nephritis may occur following any organic disease. In small animals it frequently follows the ingestion of decayed foods, the preformed toxins are absorbed and eliminated through the kidneys, producing a severe form of acute nephritis. The same condition may result from absorption of products from wounds, from mange, eczema, etc., especially when extensive.

Acute nephritis also develops from vegetable and mineral poisons, especially when introduced in rather large quantities. Such substances, as cantharides, carbolic acid, arsenic, oil of turpentine, extract of male

fern, mercury preparations, etc., are eliminated *via* the kidneys and excite an acute inflammation. This same condition has been observed in cats from eating large numbers of insects (grasshoppers).

Injuries in small animals are very common, such as blows across the back in the region of the kidneys, being run over by vehicles, falling, etc., which may result in direct injuries to the kidneys and eventually in acute inflammation. Subjection to extreme cold has been considered one of the etiological factors: it probably reduces the general resistance of the renal tissue so that infectious substances have a greater effect upon it. This has been observed, especially in puppies and kittens that have been kept in damp, cold kennels. The same thing is found in hunting dogs after being forced to wade or swim through cold water.

Pathology.—This is usually divided into three classes as follows:

(a) *Parenchymatous nephritis*, in which the primary inflammatory changes are most pronounced in the parenchyma of the kidney. This is characterized by only slight swelling, the capsule more easily removable, and on cut section a grayish or dull color is noted. Sometimes, there will be observed grayish-red or yellowish-brown spots. The medullary substance is hyperemic, often dark red in color and the Malpighian bodies are quite prominent, while the balance of the organ is either normal or of a soft consistency.

Microscopically the veins and capillaries are enlarged, congested, granular and fibrous deposits between the uriniferous tubules, and epithelial casts, cells, fatty degeneration with swelling and opacity.

(b) *Hemorrhagic parenchymatous nephritis*, which is characterized by a large number of red points giving the external appearance of the organ a dark red color, dull gray on section, blotches of red and in the medullary portion a deep red.

Microscopically the veins and capillaries are found engorged with blood, hemorrhages appearing in the adjacent tissues.

(c) *Diffuse Acute Nephritis*.—Very noticeable is the increase in size and weight of the organ, sometimes two or three times larger than normal. The tissues are soft and friable. The capsule is easily removed, and the external surface a bright red color with some yellowish or gray patches.

Microscopically there will be found enlargement of all vessels with extensive extravasation of blood into the tissues, leukocyte casts in the dilated urinary ducts, and extensive cellular infiltration between them. The glomeruli are often filled with blood and covered with bloody extravasations.

Symptoms.—The general symptoms are loss or suppression of the appetite, slight elevation of the body temperature, pulse strong and hard at first, later weak and rapid; frequently vomiting in the dog and cat. Constipation during the early stages, followed later by diarrhea, is prominent in most cases.

Most animals have difficulty in walking (stiff gait) as the movement of the body tends to compress or move the kidneys, hence pain is induced. During the early stages of the disease there are frequently noticed paroxysms of pain, especially when the animal is first moved, or palpated over the region of the kidneys. On standing they assume a stretched attitude in order to relieve the tension on the diseased organ. Frequently in walking the limb on the side affected will be dragged or the forward step shortened.

It has been observed in male animals that one testicle will be drawn higher than the other.

The changes in the urine form the most characteristic symptom. Usually at first there is suppression, with very scanty flow of urine, highly colored, containing some blood, albumin and tube casts. The total quantity passed in twenty-four hours is greatly reduced, specific gravity high, of a thicker consistency than normal, often slimy and turbid. Hematuria may develop.

Microscopically the urine is found to contain urinary casts in large numbers, white and red blood corpuscles and numerous epithelial cells. The urine is voided a few drops at a time, especially in the dog, with pain (strangury).

Uremic symptoms are noted in some cases. The stoppage of the flow of urine from the swelling of the tissue of the kidneys, compression and filling of the ducts with exuded casts, causes a retention of waste products and a lack of secretion, hence an accumulation of urea and uric acid, and other decomposition products sufficient to produce marked symptoms. In the dog these symptoms develop rather rapidly in the form of weakness, staggering gait, convulsions, irregular temperature and coma.

Diagnosis.—This condition is very frequently mistaken for inflammation of some other abdominal organ, especially peritonitis, enteritis, cystitis, or metritis. It is possible to make a differential diagnosis by a careful examination of the animal, by observing the character and amount of urine voided and a microscopic examination of the urine.

Course.—The course is usually acute; occasionally the disease terminates in chronic nephritis.

Prognosis.—On the whole the prognosis is unfavorable, the patient often dying in six to ten days. When the symptoms of uremia are present, the prognosis should be considered very unfavorable.

Treatment.—*Dietetic.*—For the dog and cat a milk diet is of the greatest importance. Avoid the giving of irritating foods and drugs.

Medical.—Establish diaphoresis as early as possible. This can be done by the use of warm baths, steaming the animal, and rubbing the skin. Wrap the animal in warm blankets. Diaphoretics, such as pilocarpin, are not very satisfactory in small animals.

Purgatives are to be recommended. Magnesium sulfate (10. to 16.) every four hours until active catharsis takes place is useful. Small doses of arecalin (0.003 to 0.005) may be given to the dog to hasten early evacuation of the bowels.

Calomel, owing to its prompt action, is excellent for dogs. In heart weakness, during the secondary stages of the disease, digitalis fluidextract (0.1 to 0.15) should be used. Alkaline diuretics, as potassium acetate, are to be used in small doses. Diuretin has been found to be valuable as a diuretic.

In convulsions following uremia, potassium bromide, barbital or morphine for dogs should be administered. Tannic acid (0.1) is highly recommended.

Chronic Nephritis.—**Definition.**—A chronic inflammation of the kidney, which may be divided clinically into two groups, viz.:

(a) Chronic parenchymatous nephritis, characterized by marked dropsy and during the early stages of the disease, on postmortem, by the large

white kidney. In the later stages of the disease the kidney usually is small—small white kidney.

(b) Chronic interstitial nephritis, characterized by cardiovascular changes which are pronounced, but only in a few instances will dropsical conditions appear.

Etiology.—It has been observed that chronic nephritis in some instances follows the acute form of the disease. This is true no doubt only in the subacute or milder acute cases.

It may develop gradually as an insidious disease without any apparent cause.

Injurious substances in the form of irritants, which may be either parasitic or chemical in nature, in being eliminated *via* the kidneys, may produce sufficient irritation to induce a chronic inflammation. Certain drugs when administered for some time (turpentine) or absorbed from the skin, as in the treatment of mange (coal-tar compounds), will produce irritation resulting in chronic nephritis.

It may follow some of the infectious diseases, such as distemper in the dog and cat. The excess of waste products together with the various toxins formed are eliminated in such quantity that they irritate the renal tissue.

Subjection to extremes in temperature (cold or heat) disturbs metabolism which increases the action of the kidneys, and the amount of albuminous decomposition may be a cause. In other cases no apparent cause can be found.

Pathology.—(a) In chronic parenchymatous nephritis several varieties have been recognized.

The large white kidney is characterized by enlargement, the capsule very thin. When cut longitudinally the cortex is swollen and yellowish-white in color, mottled on surface with a number of opaque spots. The pyramids of the kidney are deeply congested.

The small white kidney in which the connective tissue is found thickened, and a gradual reduction in the enlargement of the parenchymatous tissue. On cut surface the resistance is much greater than the other type, the cortex is much smaller and contains a number of white or whitish-yellow spots. These whitish-yellow spots represent areas of fatty degeneration. The interstitial tissue is changed, enlarged, many of the glomeruli destroyed, degeneration of the epithelium in the convoluted tubules, and the arteries are much thickened. Microscopically the epithelium is found granular and fatty; the tubules of the cortical substances are enlarged and filled with tube casts. Hyaline changes are found in the epithelial cells. The glomeruli are found enlarged, the capsules are thicker than normal, and the capillaries show some hyaline changes. The interstitial tissue is increased to some extent.

(b) In chronic interstitial nephritis the kidney is small, contracted,

interstitial connective tissue is far in excess of the parenchymatous structure.

Microscopically there is noted a great increase in the connective tissue, a degeneration and atrophy of the secreting structures, both glomerular and tubal. The increase in the fibrous elements is widely distributed throughout the kidney, although in most cases found more extensively in the cortical portion. The glomerular changes are found marked, numbers of them being completely degenerated into hyaline substances. The tubules show changes in the epithelium, in some instances greatly atrophied, in others the epithelium has entirely disappeared.

The blood-vessels (arteries) in the advanced cases show advanced sclerosis. The changes take place in the entire vessel wall. In chronic nephritis we find in a great many cases in dogs organic changes in the heart (hypertrophy).

Symptoms.—This condition does not present very definite symptoms until the disease is quite well advanced. The first symptoms noted are those of a general nature, such as partial or complete loss of appetite, weakness, fatigue, etc.

In parenchymatous nephritis the secondary symptoms are characterized by dropsical swellings appearing on the limbs, breast, and particularly ascites. The animal shows general emaciation, pale membranes, and all the signs of general cachexia. A careful examination must be made in such cases to distinguish from circulatory disturbances. The urine should always be carefully examined. We will find in these cases the amount of urine decreased and its specific gravity increased. The urine will also be found to contain numerous casts, epithelium, fat cells, and in some cases red blood corpuscles. The pulse will be found accelerated, tense and hard; the heart beat is strong, palpitating, and in smaller breeds may shake the entire body. Marked dulness over the region of the heart is noted indicating hypertrophy. The temperature is slightly elevated until in the later stages of the disease when it will be found to be subnormal. In the very late stages symptoms of uremia appear, with rapid emaciation and exhaustion, and the animal soon succumbs.

In chronic interstitial nephritis the symptoms are somewhat different. The most noticeable difference is in the character and composition of the urine. The amount of urine is increased, the specific gravity very low, and the albumin content is greatly diminished. There is compensatory hypertrophy of the heart, and if this compensating action is sufficient, the animal may live for some time. However, sooner or later there will be insufficient heart action, the pulse will become weak, feeble, and ascites and edemas appear. The animal gradually becomes weaker and finally dies from exhaustion.

Diagnosis.—This is only possible in cases where a careful examination is made of the urine, together with a painstaking general examination. We must differentiate chronic nephritis from primary circulatory disturbances.

Prognosis.—In both forms of chronic nephritis, the prognosis should be considered unfavorable, because in the majority of cases the condition is quite well advanced before a diagnosis is made. Even in apparently mild cases marked pathological changes in the kidneys are often found.

Treatment.—*Dietetic.*—Improve the general condition of the animal by giving plenty of milk and easily digested food. Avoid highly nitrogenous foods.

Medical.—The first thing to be considered from a medical standpoint is to sustain and strengthen the heart action by giving small doses of fluid-extract digitalis (0.1 to 0.15) daily. As a diuretic, administer diuretin (0.2 to 0.4) twice daily. Calomel is useful in dogs to keep the bowels open and assist in the elimination of waste products.

In dropsical conditions (ascites) small doses of pilocarpin (dog and cat 0.003 to 0.01) may be administered once daily. Small doses of potassium iodide (0.06 to 0.2) are to be administered as a resorbent once daily to dogs.

Surgical.—When ascites threatens the life of the animal the fluid should be removed with a trocar. (See Abdominal Puncture.)

Purulent Nephritis (Kidney Abscess).—**Definition.**—An inflammation of the kidneys resulting from infection and characterized by the formation of either numerous small purulent foci, or larger abscesses.

Etiology.—A very common cause of this condition is the infection reaching the renal tissue from the blood stream (hematogenous). This mode of infection in most cases follows diseases of other organs, or pyemia, such as endometritis puerperalis in the bitch and cat; mammitis, pneumonia, phlegmonous pharyngitis in the cat; purulent bronchial catarrh, distemper, and, in puppies, infection at birth. It has been found that purulent nephritis will be produced in animals without any particular focus of infection. In cases of general reduced resistance the organisms may find their way to the renal tissue, develop and form abscesses.

Traumatic causes are quite common in small animals as injuries over the region of the kidneys are frequent. These may bring about the condition by reducing the local resistance and the accompanying inflammation makes a favorable place for the development of organisms which are present in the blood stream.

Urogenic causes are perhaps the most frequent. The infection spreads to the organ *via* the bladder, ureters, and pelvis of the kidney.

In small animals subjection to extremes in temperature has been mentioned as an indirect factor in bringing about the condition.

Pathology.—We recognize two forms of purulent nephritis on post-mortem:

Diffuse Purulent Nephritis (Nephritis Purulenta Punctata, Diffusa).—In this form the kidneys are enlarged; numerous small white spots or yellowish dots are present which are surrounded by a reddish zone. On close examination the purulent masses may be easily removed. These foci of infection may be found quite generally distributed in one or both kidneys.

Microscopically there is found a large number of pus cells in the foci of infection, cellular infiltration with large numbers of bacteria present in the tissue surrounding them. The epithelial cells show fatty degeneration, the glomeruli surrounded by pus, and the tubules partially filled with leukocytes, red blood cells, and casts.

Nephritis Apostematosa (Renal Abscess).—We find in this form abscesses of varying size, which may be a single abscess formed from an embolus, or the kidney tissue break down to form a very large abscess (pyonephrosis). The connective tissue increases around the abscess forming a thick wall.

Symptoms.—Clinically it is quite difficult to recognize this condition. In cases which originate by metastasis we will observe the symptoms of the primary condition, such as pyemia, endometritis, etc.

Should the disorder develop rapidly, there will be found practically the same symptoms as in acute diffuse nephritis. (See Acute Nephritis.)

In dogs the patient becomes very stiff, refuses to move, shows pain on palpation over the region of the kidney; in some cases a distinct enlargement on one or both sides high in the lumbar region can be determined. In examining such cases the animal should be placed in a standing position, both hands used, one on either side of the animal, and the palpation performed with gentle pressure. Micturition is painful, very often only small quantities of urine being voided. As the disease progresses more pronounced general symptoms of weakness, exhaustion, and uremia will be observed. Animals often die very early from general sepsis.

Diagnosis.—An accurate diagnosis is very difficult. In many cases the disease is not recognized until a postmortem examination is made. The symptoms, including careful palpation coupled with examination of the urine, usually suffice for the diagnosis.

Prognosis.—The prognosis is bad as the disease is usually in an advanced stage before being recognized.

Treatment.—In cases of advanced renal abscess there is little that can be done. The operation of removing one kidney does little good as both are usually diseased. Uremia commonly follows the removal of the kidney when both are involved. Symptomatic treatment is about all that can be done. Heart stimulants, laxatives, etc., may be tried. (See Acute Nephritis.)

INFLAMMATION OF THE RENAL PELVIS

Pyelitis

Definition.—Inflammation of the pelvis of the kidney.

Etiology.—Pyelitis may result from the spread of inflammation from adjacent parts or organs, such as from the kidney (pyelonephritis) or from the bladder (pyelocystitis).

The presence of urinary calculi in the pelvis of the kidney mechanically irritates the membrane and leads to an inflammation.

In the course of infectious diseases (distemper in the dog and cat) this condition develops on account of the infectious or poisonous matter excreted from the body *via* the kidneys irritating the mucous membrane.

Excretion of toxic materials (poisons of different kinds) would act in a similar manner. On account of the frequency of poisoning in small animals this is a very common cause.

Parasites may cause pyelitis, especially in dogs (*Dioctophyme renale*). The parasites cause an intense inflammation of the pelvis of the kidney which may involve the entire organ.

Retention of urine from either disease of the ureters or the bladder. This leads to an inflammation of the pelvis of the kidney from decomposition of the urine.

Pathology.—Catarrhal inflammation of the pelvis of the kidney is characterized by swelling and redness, some hemorrhage, and later, as the condition becomes chronic, the membrane becomes thickened, lighter in

color and covered with thick mucus or pus. In severe cases numerous hemorrhagic foci will be observed, with sometimes extensive hemorrhage, or, if the irritation has been severe, ulcers will be found (pyeloulcerosa). In cases which have resulted from obstruction to the flow of urine, we may find dilatation of the pelvis of the kidneys, with the presence of urine (hydronephrosis).

Symptoms.—This disease does not present a clear clinical picture; it can easily be confused with inflammation of the kidneys or adjacent parts. The general symptoms are a disturbed general condition of the animal, frequent micturition, which is more or less painful, stiff, painful gait, loss of appetite and slight elevation of temperature. The urine shows changes which should be considered. It will be found to contain much mucus, pus, organic sediment, long-tailed epithelial cells, having pointed projections on the ends, which come from the membrane of the renal pelvis. The urine should be examined for parasite eggs; this will often assist in locating the seat of the inflammation. Small granules are found when calculi are present. Careful palpation as in chronic nephritis may assist in locating the inflammation.

Diagnosis.—The microscopic examination of the urine is the best means of making an accurate diagnosis. The presence of the peculiar, molar-shaped epithelial cells may be considered significant. Pyelitis must be differentiated from inflammation of the mucous membrane of the bladder or ureters. The presence of parasite eggs (*Dioctophyme renale*) in the urine will be indicative of involvement of the renal pelvis.

Prognosis.—The prognosis depends to some extent upon the causative factor. In most cases it is not very favorable.

Treatment.—*Dietetic.*—Milk should be the principal food. No irritating materials should be given.

Medical.—Dilutents in the form of water or milk should be administered frequently (two or three times daily) to assist in increasing the volume of fluids eliminated via kidneys to remove accumulated products.

Disinfectant in the form of sodium salicylate (dog, 0.1 to 2.; cat, 0.05 to 0.1) should be given twice daily. Urotropin (0.5 to 1.) three times daily with plenty of water or milk is useful.

UREMIA

Definition.—A toxemia developing during the course of certain diseases, such as nephritis or in conditions associated with retention of the urine. The nature of the poisons retained in the body is not definitely known. They may be normal urine compounds, or the result of abnormal metabolism.

Etiology.—Uremia is produced by the retention in the body of waste materials which should be eliminated by the kidneys. In the development of certain diseases, such as acute and chronic nephritis, or obstruction to some part of the urinary passages, the waste materials are not properly excreted but are retained in the blood. If due to stoppage of the outflow, the back pressure produced inhibits further secretion, hence the products of metabolism accumulate in the body.

A cause is rupture of some of the urinary organs (kidneys, ureter or bladder) which is of frequent occurrence in the dog from injuries. The urine will flow out into the adjacent tissues, or peritoneal cavity, to be

absorbed by the circulation, producing in the course of a few hours marked symptoms of acute poisoning.

Symptoms.—Clinically we recognize two forms: (a) acute uremia, and (b) chronic uremia.

Acute Uremia.—In the dog the symptoms usually begin with chills, trembling of the muscles, staggering gait, followed in a short time by stupor, the animal finally lapsing into complete unconsciousness. Frequently there will be noted during the development of uremia certain nervous symptoms, such as contractions of groups of muscles (clonic spasms, epileptiform convulsions) followed by unconsciousness. Yelping or howling is often a prominent symptom during the nervous attacks.

The respirations are slow, often difficult; edema of the lungs usually exists.

The temperature is at first elevated, but later becomes subnormal, sometimes as low as 96° F.

Vomiting in the dog and cat is a frequent symptom as is diarrhea. The discharges from the stomach and bowels usually have a uriferous odor.

Chronic Uremia.—Chronic uremia develops from chronic diseases of the urinary organs, particularly chronic nephritis, and from long standing cases of partial urine retention due to some obstruction in the urinary tract.

The most prominent symptoms of chronic uremia are: digestive disturbances, such as gastro-intestinal catarrh, diarrhea, vomiting, etc., without any apparent cause; disturbances in the nervous system as dullness, and at times epileptiform convulsions, which are usually mild and recurrent.

Diagnosis.—This is made by careful examination of the patient, observation of the symptoms, and examination of the urinary organs.

Prognosis.—The prognosis depends upon the primary condition producing the uremia. In acute uremia it is unfavorable, most cases terminating fatally.

Chronic uremia is not so immediately fatal. The long course of the disease, which suffers exacerbations and remissions, eventually, however, terminates in death.

Treatment.—*Medical.*—Medical treatment consists in the administration of laxatives to assist the elimination of urea compounds *via* the bowels. Diuretics are used except in those cases where there is some impediment to the outflow of urine.

In chronic cases, after the uremic symptoms begins to disappear, tonics and alteratives are indicated.

Surgical.—Where an obstruction exists in some portion of the urinary tract, which interferes with the outflow of urine an operation may be indicated. Rupture of the bladder or ureters should receive immediate attention and the torn or injured part sutured.

CALCULI IN THE KIDNEY

Nephrolithiasis

Definition.—The presence of urinary stones in the pelvis of the kidney.

Etiology.—Calculi in the renal pelvis are not frequent in small animals. They are far more common in the bladder. The principal condition for the formation of urolithic deposits is that the urine contains excess of salts.

or that insoluble or slightly soluble salts are formed in it. In the elimination of these salts they become gradually deposited around some foreign material. The center or nucleus of a calculus is usually an epithelial cell, bit of mucus, pus, a blood cell, cast, etc. In some cases the food which is rich in salts of various kinds will hasten the formation of calculi. In certain districts where the water is rich in mineral substances calculi are more common, no doubt due to the excess salts taken in and eliminated. Inflammatory diseases of the urinary passages, or retention of urine from any cause, will often lead to the formation of urinary calculi by changing the character of the urine and the salts contained therein.

Pathology.—Stones in the pelvis of the kidney, if small, may not produce much change in the mucosa, except slight abrasion and irritation. When larger they may fill up the entire calices or the whole renal pelvis, and can lead to marked pathological changes such as extensive inflammation, hemorrhage, and sometimes marked distention of the pelvis. In small animals the calculi usually consist of ammoniacal magnesium phosphate, small quantities of calcium phosphate or carbonate, some uric acid and its salts. Cystic calculi are also occasionally seen. They are small, soft, and have a shiny surface.

Symptoms.—The clinical picture of kidney stones is very similar to that of pyelitis, except the pain is usually more severe. The condition may be entirely overlooked during the life of the patient. The most pronounced symptoms are sudden attacks of colic, which come on after running, jumping, or falling, which dislodge the stone and occlude the ureter. The colicky symptoms are howling, whining and crying, which continue until the stone either passes into the bladder or back into the pelvis of the kidney. A prolongation of the retention of urine may result in uremic symptoms. Periodic recurrence of the colicky pains is somewhat characteristic of this condition. The urine when examined microscopically will be found to contain pus cells, epithelial cells, and often very small fragments of stone. Blood cells are also common as small hemorrhages frequently take place. In the dog a direct examination can be made by performing a laparotomy which permits of the kidney being seen and felt. If calculi are present, they will be easily recognized by their hardness and shape.

Diagnosis.—The general symptoms are not sufficient for an accurate diagnosis. It should be differentiated from other diseases of the kidney. The urine should be carefully examined. In doubtful cases roentgen-ray may be used or laparotomy may be performed.

Prognosis.—The prognosis depends on the size and number of stones present and whether or not the condition is unilateral or bilateral. When the stones are small and the condition confined to one kidney, the prognosis is much more favorable. Owing to the difficulties encountered in removing the stones the prognosis is usually unfavorable.

Treatment.—*Dietetic.*—Food should be given that contains but a small quantity of salts. Plenty of water should be allowed but the same precaution must be observed in regard to the salt content.

Medical.—The various compounds used to dissolve calculi have not proved very satisfactory. Large quantities of carbonated water may be tried; it has proved of value in some cases.

Surgical.—Surgical treatment has proved of practical importance in the dog, and has been successfully accomplished in a number of cases. If,

after an explorative laparotomy of the kidney, it is found normal, showing no evidence of hydronephrosis, nephrolithotomy should be performed. There are two methods used in this operation, as follows:

(a) A longitudinal incision is made at the convex border of the kidney, at which point the vascularity is at a minimum, into the pelvis. In case hemorrhage is severe, clamping the renal artery will control it. By compressing the kidney longitudinally the incision will be held open and with a blunt curette the stones are removed. Care should be taken to be sure that the renal pelvis is freed of all the calculi, and a blunt probe of small caliber inserted into the ureter to be certain of a free passage into the bladder. Normal salt solution, which has been previously sterilized, is used to cleanse the cut surface. The wound is then stitched with sterile silk, using two or three interrupted sutures. Care must be taken not to use too much force in drawing the wound together as the resulting swelling will tear out the sutures. Return the organ to its proper position. Healing should take place *per primam*.

(b) The other method is to open the pelvis of the kidney direct. Make an incision at one side of the pelvis, in about its middle portion, of sufficient size to remove the calculi. After all the stones have been removed and all the fluids absorbed by sterile gauze, the wound is stitched carefully, using plenty of sutures so that the edges of the wound will be thoroughly approximated. This must be done carefully to avoid fistula following the operation. If, however, the kidney is found diseased (hydronephrosis) nephrectomy should be performed, as follows: laparotomy is performed. The kidney is then freed of its covering, gently pulled toward the wound, and doubly ligated at its pedicle, so as to prevent serious hemorrhage. Care should be taken to get the ligature securely in place to prevent its slipping off after the abdominal wound is closed. Double ligation is safest, ligating the vein and artery separately.

After-treatment consists in the administration of general stimulants, and restricting the diet for four or five days to milk, or milk and eggs.

DROPSY OF THE KIDNEY

Hydronephrosis—Cystic Kidney

Definition.—A chronic condition in which urine collects in the pelvis of the kidney or the kidney proper, leading to functional disturbances of the organ.

Etiology.—(a) Mechanically by some impediment to the flow of urine from one or both kidneys. The urine is dammed up in the pelvis of the kidney with a gradually increasing pressure. As the pressure of the urine increases, the loss in the secreting power of the organ is more manifest, and eventually if the pressure is constant or increased, the function of the organ may be entirely lost. The parts of the urinary passages affected by the impediment gradually dilate and the renal tissue atrophies, so that the condition anatomically stops as no more urine is secreted.

(b) A number of conditions which cause partial stoppage of the flow of urine will cause cystic kidney. The most frequent are: catarrhal inflammation of the ureters, bladder, or prostate glands; the presence of calculi in some portion of the tract which interferes with the passage of urine.

(c) Sometimes the condition is congenital; there is either no opening through the ureter, or it is otherwise anatomically deficient. This allows the urine first formed to accumulate until the backward pressure is sufficient to stop renal secretion.

(d) Compression of the urethra and neck of the bladder by adjacent growths. The new growths interfere with the flow of urine and cause it to accumulate in the pelvis of the kidney.

(e) Paralysis of the urinary bladder which allows the urine to collect and lead to back pressure.

(f) In chronic inflammation of the kidneys some of the urinary tubules become constricted at certain points by the contraction of the interstitial tissue, which undergoes atrophy, causing the canals which are attached to the Malpighian bodies to become dilated. If the urine continues to be secreted it accumulates and forms small retention cysts. These cysts may be found singly or in large numbers in the kidneys. This type of the condition is not found as often as the other form.

Pathology.—We find varying degrees of cystic kidney. In the early cases will be noted only a dilation of the calices and pelvis of the kidney with mild pathological changes in the lining membrane. In the more advanced cases will be noted distention of the pelvis of the kidney with compression of the renal tissue so that the atrophy is well marked. In some cases the renal tissue will be practically destroyed, and the kidney will be represented by a soft undulating mass. In dogs the kidneys may be so enlarged that distention of the abdominal wall appears.

Symptoms.—Frequently on autopsy cystic kidney involving one of the kidneys, will be found which has not been noticed during the life of the animal, the other kidney having performed the function of both. When both kidneys are involved, however, a change in the quantity of urine will be noticeable. On careful examination of the patient (dog) very frequently one of the kidneys, or in rare cases both of them, will be found much enlarged and can be easily palpated through the abdominal wall; enlargement appearing where the abdominal enlargement is noticeable by observing the standing patient from the rear and carefully comparing both sides. General symptoms of weakness, stiffness, etc., are shown in the more advanced cases. Generally, however, cystic kidney does not produce characteristic symptoms during life.

Diagnosis.—This is made by careful examination of the patient, observing the flow of urine, and finally where necessary an explorative laparotomy.

Prognosis.—Favorable when unilateral as it may not affect the general health of the patient; unfavorable when bilateral.

Treatment.—The early indication in the treatment is to relieve the impediment to the flow of urine. The ureters, bladder, and urethra should be examined and if diseased proper treatment should be given. If the outflow of urine can be reestablished, the disorder will be relieved. If this is impossible, nephrectomy should be performed if the condition is unilateral. (For Nephrectomy, see Renal Calculi.) No other treatment has been found of value.

AMYLOID KIDNEY

This condition is of no practical importance except to the student in pathology. It is not common in the small animals and the symptoms are

TUMORS OF THE KIDNEY

In small animals the kidneys are not commonly affected by primary tumor formations. There will be found: sarcomata, carcinomata, and adenomata, occasionally resulting as secondary growths from some other organs or tissues. Tuberculosis of the kidney has been noted in a few cases in the dog. It may be either metastatic or urogenic in origin.

It is not usually possible to recognize tumors during life. They sometimes produce disturbance in kidney function and may become metastatic.

Treatment.—Treatment must be symptomatic.

ANIMAL PARASITES IN THE KIDNEY

Dioctophyme renalis.—This is the largest nematode known and occurs in various countries in the kidneys and other organs of the dog, fox, otter, beech marten, skunk, mink, weasel and other wild carnivores. Its location is usually the pelvis of the kidney, but may be found in the ureter, bladder and urethra and even in the peritoneal cavity.

The worms have a blood-red color with a number of fine transverse stripes. The males measure up to 35 cm. by 3 to 4 mm., and the female up to 103 cm. by 5 to 12 mm. The eggs are barrel-shaped and the shells are pitted, except at the poles. They measure 71 to 84 by 46 to 52 microns.

The life cycle of the *Dioctophyme renale* is not entirely known. The ova are passed in the urine of the host, and undergo further development in water or damp soil. They require some time for these changes to take place (from three to six months). The embryo may live and be active after one year to eighteen months. The embryo is 240 microns long and 14 microns broad, cylindrical, and gradually tapering posteriorly; the head is pointed, mouth terminal and not provided with papillæ, but with a small projection which no doubt serves the embryo as an organ of penetration. The intermediate host has not been fully determined, but the infective stage is presumed to be in some species of fish.

Pathology.—The parasite after reaching its destination, develops and produces marked changes in the pelvis of the kidney, and in a number of instances completely destroys the organ. In cases of early invasion there will be found purulent inflammation with hemorrhages. More advanced cases will reveal a secondary inflammation with destruction of the renal tissue, often transforming the kidney into a sac with thick walls. The worm or worms will be found coiled up in this sac. The number of parasites found will vary. In most cases only one; in others two or more, even as high as four have been found.

eggs of the parasite. In some instances after the renal tissue is completely destroyed, the parasite will pass into the urethra where it becomes lodged. It may burrow through the urethral wall and ultimately lodge in either the pelvic fascia or work forward into the abdominal cavity. Eventually it will produce inflammation in the new location, resulting in abscess, perforation and external fistula. Peritonitis may result following its entrance into the abdominal cavity.

Diagnosis.—An accurate diagnosis can be made only by finding the eggs in the urine by microscopic examination.

Prognosis.—When the parasite has produced sufficient pathological changes to bring about emaciation and exhaustion, the prognosis is unfavorable.

Treatment.—Unknown.

Prophylaxis.—Animals should be prevented from eating raw fish which may be infected with the larval form.

CHAPTER II

DISEASES OF THE BLADDER

Examination.—A thorough and complete examination of this organ may be made, especially in the dog, by palpation through the rectum, vagina, and abdominal walls; by laparotomy (direct examination) and by examination of the urine.

Palpation can be done satisfactorily only in the larger breeds when not too fat. When palpating through the abdominal wall place the animal in a standing position, and, with one hand on either side of the lower abdominal wall, just anterior to the brim of the pubis, exert enough pressure to feel the bladder through the walls. In case inflammation is present pain will be evinced. The bladder will be felt as a pear-shaped enlargement just anterior to the brim of the pubis, which is movable and extends forward a varying distance depending upon its distention. Care must be taken to differentiate between a distended bladder and other abnormalities which are commonly present in the abdominal cavity, such as ascites, fecal stasis, neoplasms, etc.

Rectal palpation is done by first thoroughly cleansing the anal region with soap and water, followed by an application of boric acid solution (2 per cent). The gloved index finger is inserted through the anal opening as high up in the rectum as possible. The bladder can be felt as a distended body, projecting back into the pelvic inlet. Differentiation must be made between a distended bladder and chronic or acute prostatitis which is quite common in old dogs. This can be done by considering the difference in position and density of the two bodies. Inflammatory conditions of the bladder, which are painful on pressure, and other enlargements such as tumors may be found in this location.

Vaginal palpation is possible in the larger breeds, and is performed in much the same manner as the rectal. The gloved index finger should be inserted as far as possible, and if the bladder is distended it can be felt at the pelvic inlet, or if it is inflamed slight pressure will be very painful. Vaginitis, fecal accumulations in the rectum, and tumors should be differentiated.

Laparotomy.—In both the male and female dog it is quite possible, safe, and practical, to perform this operation under strict antiseptic precautions, so that a direct inspection of the bladder may be made. In the female the incision should be made just anterior to the pubis in the median line, and in the male to one side of the penis but close to the pubis. The incision should be made large enough (2 or 3 inches) so that the bladder may be exposed to view. Care should be observed in cutting through the peritoneum so as not to incise the bladder, as this organ when distended will extend forward in some cases beyond the umbilicus. The bladder is examined for distention with urine, inflammation (acute and chronic), calculi, ulcerations, paralysis, etc. The laparotomy wound should be closed as usual. (See Laparotomy.)

Examination of the Urine.—A sample of urine is best obtained by passing a catheter, provided there is any urine present, or by catching the urine in

some receptacle as it is passed by the animal. Catheterization has been found to be the most practical method in these animals. This is done in the male animal by placing it in a dorsal position; restrain with hobbles. Choose a small sized human catheter, soften and disinfect by placing it for ten to fifteen minutes in warm lysol solution (2 per cent). Expose the penis by pushing back the prepuce with the left hand, and with the right hand insert the catheter into the urethral opening. Two normal obstructions will be noted as the catheter is inserted: the first one as the catheter reaches the bone of the penis; the other as the catheter reaches the ischial arch. The former obstruction may be overcome by gentle pressure; to pass the ischial arch it will sometimes be necessary to partially remove the stylet, and with the finger direct the catheter over this point. The stylet should be gradually removed as the catheter is inserted. When it reaches the bladder, if urine is present, it will begin to flow out at once. In the female animal the catheter is passed without much difficulty. It is best to place the animal in a ventral position, securely fastened with hobbles; the same catheter as for the male animal can be used, but best to use a special metallic catheter, as it can be sterilized. To insert the catheter a vaginal speculum is used to dilate the vagina, which facilitates insertion into the urethral opening.

The urine should be examined particularly for epithelial cells, pus, bacteria, red blood cells, etc. A differential examination should be made to determine whether the abnormal constituents of the urine come from the bladder or some other urinary organ. Note the reaction of the urine, its specific gravity, color, odor, consistency, etc.

WOUNDS OF THE BLADDER

The bladder is the seat of several conditions produced by trauma in the small animals: traumatic or spontaneous rupture, penetrating wounds from bullets or other objects, accidental cutting of the bladder during surgical operations.

RUPTURE OF THE BLADDER

Rupture of the bladder is most often brought about by the animal being run over by vehicles, being kicked, falling, or may be due to overdistention when there is some impediment to the flow of urine. It can also occur as the result of the walls being weakened by ulceration and other destructive processes. It has been observed in well broken house dogs when confined for too long a period, the bladder becoming distended and finally paralyzed, the continuance of the secretion eventually leading to rupture.

Symptoms.—In rupture the symptoms develop in the course of a few hours. They are complete suppression of micturition, general symptoms of collapse, uriferous odor of the exhaled air, subnormal temperature. The history is quite important, as often the history of an injury will assist in the diagnosis of rupture. Passing the catheter will reveal the empty bladder. Examination by performing laparotomy should be done as early as possible in all cases where rupture is suspected.

Prognosis.—After the development of general symptoms of collapse, subnormal temperature, etc., the condition is considered unfavorable. In cases of rupture where the diagnosis is established early, or, in accidental

cutting through the walls of the bladder during surgical operations, the prognosis is quite favorable, provided prompt treatment is given.

Treatment.—Medical.—It is always advisable to administer stimulants at once. Strychnine in small doses (0.001).

Surgical.—Prompt surgical treatment is absolutely essential for a successful termination.

The animal should be properly prepared for laparotomy (see Laparotomy), and the operation begun as soon as possible. The abdominal cavity should be emptied of all the retained urine, by flushing thoroughly with normal salt solution, which should be repeated two or three times to be sure that all the urine is removed. Locate the wound in the bladder and suture with interrupted and Lembert stitches. A milliner's needle will be found to be the best suturing needle. Place the stitches quite close together. Suture the abdominal wound in the usual manner. The after-treatment consists in placing the animal in a warm place and using stimulants for the first ten to twelve hours. Thoroughness in treating these cases will often bring excellent results.

Wounds of the bladder, such as gunshot wounds, injury by compression without complete rupture, puncture by fragments of bone, etc., are found in the dog, and their seriousness depends upon the degree of injury. In very small punctured wounds and small bullet wounds, aside from the symptoms of cystitis, and stiffness, no serious complications set in and the animals make prompt recoveries. In the other forms when urine escapes into the peritoneal cavity and some hemorrhage takes place, the case will soon assume serious complications. (See Rupture of the Bladder.)

Symptoms.—The early indication of retention of urine is ischuria (suppression of urine), or painful micturition with only a small amount of urine passed. In the dog micturition is accompanied by severe straining.

In sensitive small animals there is usually considerable abdominal pain, resembling acute indigestion or colic. The back is arched and the gait is stiff and straddling.

In a short time, in case the condition is not relieved, the symptoms will increase in intensity until the bladder ruptures, in which case the symptoms of pain will disappear for a time until peritonitis and uremia develop. If the bladder ruptures symptoms of uremia will develop in a few hours. (See Uremia.)

In the dog the distention of the bladder will produce a noticeable increase in size of the abdominal cavity. Careful palpation will reveal the distended movable bladder. When rupture occurs the fluid will be detected free in the abdominal cavity. In such case puncturing the abdominal wall with an exploring trocar will reveal the presence of urine. Care should be observed, however, to determine whether the fluid is in the cavity or still in the bladder, as the distended bladder can extend well forward in the abdominal cavity.

Diagnosis.—The symptoms should be noted carefully. If the patient shows colic, frequent micturition, with small quantities of urine passed, a careful and thorough examination of the urinary organs should be made. As retention of urine in most cases is secondary to some disease of the urinary organs, a careful examination should be made to determine the primary condition. The examination may include puncturing the abdominal walls, laparotomy, rectal or vaginal exploration.

Prognosis.—The prognosis depends principally upon the possibility of relieving the primary condition, and whether or not the bladder is still intact. In case of rupture it is unfavorable, especially when symptoms of uremia are present.

Treatment.—The treatment must be directed toward removing the causes. In cases of paralysis of the walls of the bladder, it is advisable to remove the urine as early as possible. This can be done in most cases by catheterization. Small doses of strychnine (0.001, dog) are recommended to give tone to the walls of the bladder.

In spasms of the sphincter vesicæ, catheterization may be tried; if unsuccessful, puncture the bladder and remove a portion of the urine. A small dose of morphine will overcome the spasmodic contraction, allowing the urine to flow out.

In case an obstruction to the outflow of urine exists, treatment must be applied to remove it.

House-broken dogs should be allowed to run out of doors at regular intervals to avoid extreme distention.

INCONTINENCE OF URINE

Definition.—A constant discharge of the urine from the bladder; inability to retain urine.

Etiology.—Incontinence may result from several different causes:

(a) Affections of the spinal cord, as degeneration, edema, compression from hemorrhage, etc.

- (b) Paralysis of the sphincter vesicæ.
- (c) Long standing cases of retention.
- (d) Lack of tone of the muscles due to senility.
- (e) Some cases of cystitis.
- (f) Injury to the sphincter muscles from surgical operations, tumors, calculi, etc.

(g) Removal of ovaries with a resultant disturbance of hormone production.

Symptoms.—Constant dribbling of urine. Examination reveals the bladder empty, and the sphincter vesicæ relaxed.

Prognosis.—Depends upon the primary cause. Usually not considered very favorable as recovery is rarely complete.

Treatment.—Symptomatic. Determine the cause and apply treatment to relieve it.

Pathology.—In the early stages of acute cystitis, the mucous membrane will be found reddened, congested, much swollen, and here and there small hemorrhages will be noted. There is usually considerable thick, viscid mucus covering the membrane, or there may be an admixture of pus. The purulent exudate often covers the entire membrane. In the later stages of the disease the mucosa is covered by a croupous or diphtheritic, yellowish membrane. Abscesses of various size may exist between the mucosa and the muscular walls. Erosions and ulcerations on the membrane are often the result of irritating materials.

In the chronic form the pathological changes are principally a thickening of the mucosa, which is corrugated, often presenting projecting growths. The muscular walls become contracted, thickened and incapable of distention. The apices of the corrugations are darkened, eroded and ulcerated. The bladder is usually empty and contracted. Inflammation of other portions of the urinary tract will be more or less apparent.

Symptoms.—In acute cystitis, the animal will show marked symptoms of difficult micturition, severe straining as if to urinate, with only small quantities of urine passed. Sometimes small quantities of blood follow the attempts to urinate. The animal stands with the back arched, shows pain when forced to move, and stiffness in walking. When moved the patient will cry out; it often assumes the attitude of urinating. An erection of the penis is a frequent symptom. Pressure over the region of the bladder induces pain. A dog being examined in the standing position will often cry out with pain, and try to bite and get away. Digital pressure either through the rectum or vagina produces the same symptoms. In most cases the bladder is found empty. Unless the condition is mild, general symptoms are usually observed. The temperature is elevated in the early stages, depending upon the cause and kind of infection. Later it may be normal or subnormal. Suppression of appetite, thirst and general depression are often observed. Uremic symptoms will be found in some cases due to reabsorption of urine, or lack of elimination in cases where the other urinary organs are involved. The urine, passed in small quantities, will be dark in color, contains varying amounts of albumin, sometimes pus, and stringy mucus. Shreds of fibrin and necrotic membrane are passed in the croupous and diphtheritic forms of cystitis. The urine is usually alkaline in reaction but may be acid. It will contain fibrin, pus cells (both the large cells and the long slender variety), crystals of ammonium urate, and numerous bacteria. The urine content assists in confirming the diagnosis. Chronic cystitis produces much the same symptoms but less severe than in the acute form. The most noticeable indications of chronic cystitis are painful micturition, the urine passed containing pus, red corpuscles, etc. The catheter should be inserted to differentiate from calculi.

Diagnosis.—In acute cystitis a diagnosis can be made by observing the symptoms, making a careful local examination, and by analysis of the urine. Diseases of other portions of the urinary tract should be considered. In chronic cystitis the diagnosis is made by the examination of the urine, and the local examination of the patient. Calculi in the bladder and the urethra should be excluded.

Prognosis.—In mild cases of acute cystitis the prognosis is usually favorable. In severe cases, owing to the changes which are produced in the walls of the bladder, the prognosis is unfavorable. Chronic cystitis

may run a long course without producing any marked symptoms. Complete recovery is rare. By careful treatment considerable improvement can be attained.

Treatment.—*Dietetic.*—Non-stimulating food should be given. Milk is perhaps the best as it contains a large percentage of water, which is desirable. Avoid giving meats until the acute symptoms entirely disappear.

Medical.—Much can be done in acute cystitis by the internal administration of antiseptics and disinfectants. Urotropin (0.25 to 0.5) two or three times daily for dogs; cats should receive about one-fourth the quantity. This preparation produces a disinfectant action owing to the liberation of formaldehyde gas.

Helmitol (dog, 1. to 2.; cat, 0.1 to 0.5) can also be used for the same purpose, administered either in the form of a powder, or may be given as a subcutaneous injection in 10 per cent solution.

Salol, salicylic acid, and resorcin may be given for a similar action. In chronic catarrh much the same treatment is recommended as in the acute

found degenerative changes from the products of the urine (uric acid), leading to necrosis of the cells, such products forming the nucleus around which the salts deposit.

(b) Disturbances of metabolism in which there will be a larger quantity of material eliminated in the form of phosphates, carbonates, oxalates (calcium and ammonium oxalate), uric acid, urates (ammonium urate), etc. The excess of these salts becomes deposited around the organic nucleus, leading to bladder calculus.

(c) The administration of foods rich in salts of various kinds will increase the quantity in the body, and consequently more salts will be eliminated.

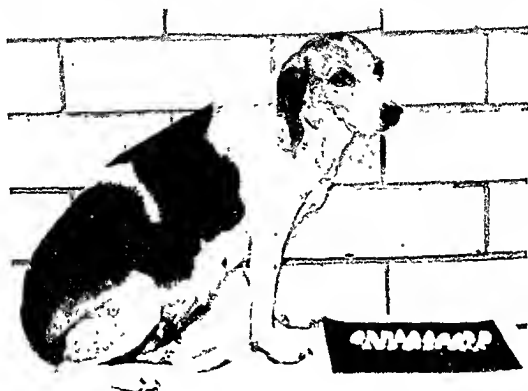


FIG. 19.—Cystic calculi.

Forms and Varieties.—1. **ACID URINE CALCULI.**—(a) *Uric Acid Calculi (Ammonium Urate).*—These are small, hard, smooth calculi, of a reddish or yellowish-brown color. They are perhaps the most common kind found in the dog.

(b) *Oxalate Calculi (Calcium and Ammonium Oxalate).*—In form these calculi are rough on the surface, irregular in shape, and usually when removed are of a dirty white or yellowish color.

(c) *Cystin Calculi.*—Soft waxy bodies, which no doubt result from disturbed metabolism of nitrogenous substances. Their color is brown or brownish-yellow. They are soft enough in most cases to be crushed between the fingers.

2. **ALKALINE URINE CALCULI.**—There will be found various forms of these concretions, such as phosphates and carbonates predominating, and in combination with other salts, etc. These calculi occur either multiple, as particles of sand or grit, or in single, large concretions. They are hard, irregular, rough or smooth stones, of a white, yellowish or dirty color, which are usually flattened, oval or oblong.

The recognition of the different varieties of calculi is important from the standpoint of recurrence and treatment following their removal.

Symptoms.—The acid concretions do not, as a rule, produce any marked symptoms, except as they impede the flow of urine.

The large, alkaline stones are most productive of clinical symptoms, and the ones which require the most radical treatment. There will be symptoms of a catarrhal inflammation of the bladder, and pus is discharged with the urine. Micturition is painful, and only small quantities of urine are passed. Attention is usually called to the case by the constant dribbling of urine.

Examination of the bladder is necessary to determine the presence of the calculus. This may be made either by digital examination through the rectum, by abdominal palpation, by laparotomy or by roentgen-rays. (See Examination of Bladder.)

Prognosis.—Cases when taken early before systemic disturbances make their appearance from absorption of urine, etc., are favorable. However, the local disturbances in the bladder produced by the calculi should be taken into consideration, for sometimes serious alterations difficult to heal will be found in the mucosa.

Treatment.—Surgical treatment is the only satisfactory method of removing calculi from the bladder. In the male animal the following procedure has been found to be the most efficient.

The animal is prepared for operation by being given an anesthetic, placed on the table in the dorsal position, and the field of operation just anterior to the pubis and lateral to the penis shaved and disinfected. The incision should be 2 to 3 inches in length, so that the bladder can be exposed. After exposing the bladder it should be well protected with gauze to prevent urine from flowing into the cavity when incised. The incision is made through the walls of the bladder where blood-vessels show the fewest anastomoses. It should be of sufficient size to remove the calculus. After the removal of the calculus the mucosa of the bladder should be examined for smaller stones or deposits, and if any are found they should also be removed with a blunt curette. The mucosa is then swabbed with gauze saturated in an antiseptic solution. The wound in the bladder is sutured with a double row of sutures bringing the serous coats in direct approximation. The sutures should be placed close together to prevent the urine escaping until adhesion takes place. The laparotomy wound is closed and protected in the usual manner. In the female two methods are employed:

(a) The animal, well hopped, is placed in the ventral position on the table. A vaginal speculum is used to dilate the vagina. A grooved director is inserted into the urethra and with a probe-pointed knife the urethra is incised back to the neck of the bladder. The stone, if not too large, is grasped with a suitable forceps and removed. After removal the bladder should be flushed out with a warm boric acid solution (2 per cent). The vagina should be flushed out daily for a few days.

(b) In case the stone is too large to be removed through the neck of the bladder without injuring the sphincter vesicæ, the operation for cystotomy should be performed as in the male.

The after-treatment consists in irrigation of the bladder (see Cystitis), and feeding plenty of milk and no meat for a week or ten days. In some

cases when hemorrhages takes place following the operation, the catheter should be passed daily to remove the urine and any clots which might form.

TUMORS OF THE BLADDER

There are a few varieties of tumors found involving this organ. The most common ones are: sarcomata, carcinomata, and fibromata. They will be recognized by the symptoms of chronic cystitis they produce, by the examination of the urine and of the bladder. If necessary laparotomy may be performed and the bladder examined direct. (See Examination of the Bladder.)

Prognosis.—This is not very favorable, especially if the tumor is malignant.

Treatment.—Resection of a portion of the bladder wall is to be recommended when the tumor formation is localized, otherwise no treatment can be given. Irrigate the bladder in the same manner as in cystitis. (See Cystitis.)



FIG. 20.—*Dioctophyme renale* (kidney worm of dog).

PARASITES IN THE BLADDER

Capillaria plica.—This parasite occurs in the urinary bladder of the dog, fox, wolf and skunk. It is apparently harmless, and no treatment except sanitation is known.

Dioctophyme renalis.—This worm is found occasionally in the bladder (see page 269).

CHAPTER III

DISEASES OF THE URETHRA

Examination.—The urethra may be examined in two ways: (a) in the male it is possible to palpate from without along its course until it passes over the ischial arch; the part within the pelvis may be palpated through the rectum. Palpation will reveal sensitiveness in cases of urethritis and calculi lodged at some point along its course. There are three parts of the urethra in which calculi are most apt to lodge: at the neck of the bladder, where the prostate glands practically surround it, and at the posterior end of the bone of the penis. At these points, owing to the structure of the urethra and adjacent parts, any foreign material passed from the bladder is most apt to become lodged. In the female, the urethra, as a rule, is free from foreign material, because any substance of this kind small enough to pass from the bladder into the urethra, will be forced out with the urine. In the female the urethra can be palpated through the vagina.

(b) Passage of the catheter or sound is a valuable means of determining the sensitiveness of the mucous membrane, the presence of calculi or other foreign material, or strictures at different points along the course of the urethra. Care should be taken in inserting the catheter not to injure the urethral mucosa; also one should not mistake the normal narrowing of the lumen of the urethra for strictures, etc.

CONGENITAL MALFORMATIONS

Occlusion of the Urethra

Occlusion of the urethra is occasionally found in both the male and female. Sometimes an opening exists in some other portion of the urethra through which the urine is discharged. Various kinds of abnormalities have been observed, such as epispadia and hypospadia.

Symptoms.—Occlusion of the urethra at its outlet is characterized in young animals by a retention of urine, enlargement of the abdomen, and no signs of micturition. The distended bladder will be found on examination.

Treatment.—Surgical treatment should be given at once. If the occlusion is at the extreme end of the urethra it should be incised at this point and the flaps stitched back to the skin to prevent adhesions taking place. The urine will usually keep the wound open. Should the occlusion be at a point higher up, in a male dog, an artificial opening should be made at the ischial arch through which the urine is allowed to pass. It may be necessary for this opening to be used permanently, in which case the edges of the membrane on either side should be stitched back to the skin, and kept clean for several days until union takes place. In the female the urethra should be opened with a pair of scissors, and kept dilated with a metallic catheter used daily.

WOUNDS OF THE URETHRA

It happens occasionally when animals are injured that the urethra will be opened at some point along its exposed portion. It will be made manifest by the presence of a wound through which urine escapes. Internal wounds of the mucosa occur from the careless use of a catheter or sound, or by foreign bodies passing from the bladder, or by weeds or straws entering the urethral outlet.

Treatment.—In extensive and severe lacerations of the urethra they should be sutured, and the wound well protected. In a short time union will take place and the urine passed normally. Injuries to the mucosa are treated by injecting mild antiseptic solutions (boric acid 2 per cent).

STRICTURE OF THE URETHRA

Definition.—A constriction of the wall of the urethra which narrows the lumen and interferes with the passage of urine.

Etiology.—This is brought about by a number of conditions which lead to injury of the mucous membrane, and in the healing process to the formation of cicatricial tissue with narrowing of the lumen, and loss of elasticity in the urethral wall. The most common causes of stricture are: operations, calculi, tumors, urethritis and torsion of the urethra occurring during copulation.

Symptoms.—Impeded or complete suppression of micturition, with straining and pain. Bladder distended. In some cases small quantities of urine will be passed after much straining.

Diagnosis.—The diagnosis is made by noting the symptoms, and the passage of a sound or catheter. Stricture of the urethra should not be confused with calculi and prostatic enlargement.

Prognosis.—Not very favorable, as complete recovery is rare.

Treatment.—The passage of a sound or catheter daily for a time will tend to dilate the urethra. The catheter or sound should be well disinfected each time to avoid infection in the urethra or bladder. No other treatment has proved of any value.

CALCULI IN THE URETHRA

Frequently in the male dog calculi are found at some point along the course of the urethra. These stones are passed from the bladder and are of sufficient size to become lodged in the urethra at the prostate gland and at the os penis. While they usually consist of one or more concretions, in some cases an impacted mass of small stones with blood or fibrin clot forms the obstruction. Occasionally there will be found injury to the mucous membrane, the stones passing out in part into the adjacent tissues.

Symptoms.—When the calculi become lodged in the urethra marked symptoms develop in a short time. If there is complete stoppage of urine, the animal will soon show distress, frequent attempts at micturition, straddling, stiff gait, evidences of urinary pain or colic. Examination of the bladder will reveal its distended condition. Should the condition continue for several hours the urine will be dammed back to produce disten-

tion of all the urinary passages. In the female, by inserting the fingers in the vagina, the enlargement can be felt.

Diagnosis.—Passage of the sound or catheter will reveal the obstruction in the urethra. Roentgen-rays will assist in making a positive diagnosis.

Prognosis.—Favorable in case treatment can be given promptly. The complications, paralysis or rupture of the bladder, should be taken into consideration, as they are apt to occur if treatment is delayed too long.

Treatment.—Surgical treatment is resorted to promptly to prevent rupture of the bladder. In case rupture threatens, use a long, disinfected, exploring trocar, disinfect the skin in the prepubic region, place the animal in a dorsal position and insert the trocar through the abdominal wall into the bladder. Allow the urine to flow out, remove the trocar and cover the wound with flexible collodion. There is usually but little danger of injuring the bowels, as the distended bladder pushes them to one side. Urethrotomy should then be performed. In the male an anesthetic (morphine or chloroform) should be administered, and the patient placed on the table in a dorsal position with the hind legs brought forward. The sound or catheter is inserted as a guide to locate the calculus, and also to assist in making the incision. The seat of operation will depend upon the location of the calculus. When located just posterior to the os penis, the incision is made at the distal portion of the enlargement. Should the calculus be at the prostatic portion of the urethra the operation should be performed at the ischial arch. The seat of operation should be thoroughly cleaned and disinfected. The incision is made immediately over the sound which can be distinctly felt. This should be made of sufficient size to allow the calculus to be removed without injuring the adjacent tissues. In some cases, when the tissues are lacerated, they become infiltrated with urine and cause considerable trouble following the operation. After the removal of the calculus, if any urine is present, it will flow out; should this fail to occur examine further for other calculi by passing the sound beyond the point of operation. When the calculus is in the prostatic portion of the urethra, the sound should be passed as before and the incision made at the ischial arch, cutting down to the catheter or sound. The urethra then is dilated by either passing a larger sound, or by inserting a grooved director and enlarging it with a probe-pointed knife. The calculus is then extracted by using a strong dressing forceps. In some cases it may be crushed with lithotomy forceps and taken out in pieces.

In the female the operation is much more simple. In some cases the calculus can be removed by manipulating it with the finger inserted in the vagina. Should this fail the urethra must be dilated or enlarged sufficiently to admit forceps for its extraction. It is best to use a grooved director and with a probe-pointed knife the urethra is divided up to the stone, where it can be extracted with forceps.

After-treatment consists in flushing out the bladder with some mild antiseptic solution, such as sodium bicarbonate (2 per cent) or boric acid (2 per cent). The wound should be left open and kept clean with antiseptics. The urine will at first pass out through the incision, but as the wound fills in by granulation, eventually it will be voided normally. In the female the vagina should be cleansed daily with antiseptics.

INFLAMMATION OF THE URETHRA

Urethritis

Urethritis is not a common primary condition in small animals, but it sometimes accompanies other diseases of the urinary organs. A primary urethritis results from infection due to the introduction of a sound or catheter or from injuries during copulation, etc.

Symptoms.—Painful micturition. Pus and blood can be pressed out of the urethra.

Treatment.—Antiseptic solutions, such as boric acid (2 per cent) or sulfate of zinc (1 per cent) are to be used as injections into the urethra and prepuce.

PART IX

DISEASES OF THE NERVOUS SYSTEM

CHAPTER I

DISEASES OF THE BRAIN

General Considerations.—Diseases of the central nervous system are usually, for the purpose of convenience and pedagogy, classified into those affecting the encephalon or brain, those affecting the spinal cord, and those affecting the peripheral nerves.

This seems to be a logical classification, and this method will be followed in preventing the diseases of the nervous system. In order to correctly diagnose diseases of this system, a knowledge of its function as well as the seat of each function is required. These will, therefore, be considered briefly.

Preliminary remarks on the functions and seat of each:

Cortex.—The cortex of the cerebral hemispheres is the seat of all psychic function, such as thought, the will and sensation, and all efferent nerve fibers originate here. The voluntary motor fibers also originate in the cortex, pass through the pons to the medulla oblongata where they cross to the opposite side and communicate with the motor nerves of the extremities. All sensory nerve fibers and fibers of special sense which conduct perceptible impulses to the brain terminate in the cortex. The cortex of the cerebrum, then, being the seat of the mind and of voluntary movement, it follows that any destructive process affecting this portion of the brain will produce psychic or mental disturbances as well as impaired mobility and sensation on the opposite side of the body, the degree of impairment depending upon the extent of the lesion.

The Midbrain (*Crura Cerebri, Corpora Quadrigemini and Optic Thalami*).—This portion of the brain is the seat of harmony of motion and equilibrium. As some of the cranial nerves arise here, the fifth pair being the most important of these, any disease, destructive process or undue pressure operating on this part of the brain will produce sensory and motor disturbances in the region of the face, lips, eyes, ears and part of the tongue, and, if extensive, the entire organism may be affected. Involuntary movements of the limbs, head, neck and eyes are the most common symptoms resulting.

The Cerebellum.—The functions of the cerebellum or hindbrain are not fully known but it is regarded as being closely connected with locomotion and equilibrium. It is also thought to be the seat of the muscle sense and assists in the coördination of the muscle movements. Each hemisphere of the cerebellum presides over the muscles of the same side of the body and if either half be injured or diseased the animal will exhibit muscular and motor disturbances of the same side, varying in degree from slight muscular incoördination to spasmodic movements, or it may walk in a circle or crowd or roll toward the injured hemisphere.

Examination.—The brain, because of its position, protected by the bones of the cranium, cannot be examined directly. Diseases of this organ can be recognized only by observing the disturbed functions produced after pathological changes have occurred. It is necessary, therefore, to examine carefully the functions of the brain before one can arrive at definite conclusions.

As the brain is the seat of the mind (thought), feeling, consciousness, sensibility and voluntary movement, any disturbances or impairment of these functions must be attributed to some pathological change in that organ.

Taking up the examination of the brain by examining its functions in the order named above, the psychic function or mental condition will be first considered.

1. **PSYCHIC DISTURBANCES.**—Any variation from the normal mental condition is manifested by abnormal excitability, or abnormal depression.

(a) *Mental Excitement.*—Abnormal mental excitement is caused by cerebral irritation involving particularly the cortex. This may be due to hyperemia, inflammatory changes, excessive heat or toxic influence. The degree of excitement may vary from restlessness to mania. In these attacks docile animals may become vicious, bite animate or inanimate objects, or even their own flesh; may stand up on their hind legs, froth at the mouth, and the eyes show a vacant, staring expression, conjunctiva injected. These symptoms may gradually subside or they may terminate in spasms and convulsions.

(b) *Mental Depression.*—This may be defined as a dulling of the psychic functions and may vary in degree from dulness to coma. Mental depression is shown by the animal taking less interest in its surroundings than usual, drooping of the head and tail, refusing to obey commands or obeys slowly or clumsily; it assumes somnolent or lethargic attitudes or may wander aimlessly about running into objects, etc. These are the milder manifestations of depression and are seen in subacute and chronic diseases affecting the brain chiefly the cortex. They may occur in acute infectious diseases, as the early stages of distemper, rabies, in severe febrile diseases, and in icterus and uremia. Other degrees of mental depression are shown by somnolency, a condition in which the animal appears to be asleep, but from which it may be roused; or sopor, deep sleep from which it is difficult to rouse the animal, and coma, or complete unconsciousness. These conditions are produced by more severe or extensive lesions. They are seen in compression of the brain, cerebral hemorrhage and tumors of the brain. They may be accompanied by motor disturbances in addition to the mental symptoms, since these conditions may involve the deeper structures of the brain as well as the cortex.

2. **SENSIBILITY.**—Disturbances of sensation may be considered as of two types, viz.: (a) pathological excitation or hyperesthesia and (b) pathological depression or anesthesia.

Hyperesthesia when observed in small animals is usually due to some of the infectious diseases, and is seen in the early stages of rabies, in tetanus, and in some of the milder diseases of the cerebrum as hyperemia and acute cerebritis. Hyperesthesia is manifested by abnormal movements of the animal which are entirely out of proportion to the stimulus applied. For example, slamming the door or clapping the hands may so excite the animal

that it will fall to the floor or ground in spasms. Local or peripheral hyperesthesia is of little or no importance in small animal practice.

Anesthesia.—This is a condition in which there is a complete loss of sensation. Diminished sensibility may be general or complete, affecting the entire animal, as in subacute or chronic inflammatory conditions of the cortex of the brain and its coverings. It may be partial or incomplete, affecting one entire side, having its origin in one hemisphere, that of the opposite side. Or it may be local, circumscribed, when more or less extensive areas of the cerebrum are involved. Depression of sensibility is determined by applying some stimulus, which when applied to the normal animal will cause pain. To test sensibility the skin is pricked with a needle or pin, pinched or burned with a heated instrument. If the animal fails to react, that is, does not show pain by crying out, whining, or trying to get away from the irritant, the area or part tested is anesthetic.

Motility.—Disturbances of motility arising from the brain vary in degree from slight incoördination to complete paralysis. They will vary in extent and character, depending upon the location and size of the lesion. Disturbed motility may be classified into (a) hyperkinesis or exaggerated action as seen in spasms and involuntary movements, and (b) akinesis or decreased action such as occurs in loss of the muscular sense and in paralysis. Disordered motility may arise from pathological changes in the brain or in the spinal cord. In examining disturbances of motility, it is sometimes impossible to locate definitely the seat of the lesion. However, if the impaired function is accompanied by mental disturbances, the brain may be regarded as being the seat of the lesion. If, on the other hand, no mental disturbances are noted, it is assumed that the lesion is in the cord. Further, the portion of the animal affected will often point to the origin of the disturbance. Hemiplegia, or paralysis of one-half of the body, and monoplegia, paralysis of a single organ or part, indicate that the disturbance is of cerebral origin, while paraplegia, a paralysis of a portion of both sides, indicates spinal paralysis.

HYPEREMIA OF THE BRAIN

Congestion of the Brain

Definition.—Hyperemia is a condition in which there is an engorgement of the vessels of the brain. The engorgement may be active or passive.

Etiology.—Active hyperemia, or congestion of the brain, may be caused by anything which affects the cerebral arterial circulation. Violent exercise, excitement, especially in young animals, blows and concussion on the head, are causes. It may accompany eruption of the permanent teeth, or abnormal heart action as in hypertrophy of the left ventricle. Excessive heat, as direct sunlight upon the head in hot weather, will also produce active hyperemia.

Infective hyperemia of the brain appears secondarily to some of the infectious diseases, the most common being rabies and distemper.

Passive Hyperemia.—The causes of passive hyperemia of the brain are chiefly mechanical, and may be anything which impedes the outflow of the blood from the brain. Tight collars will compress the jugular veins and produce it. Tumors and enlarged thyroid glands (goiter), valvular

insufficiency of the left heart, chronic diseases of the lungs as interstitial pneumonia, may produce a passive hyperemia.

Pathology.—In severe hyperemia of the brain, the dura mater or outer covering will be found injected and in cases of long standing may be adherent to the bones of the cranial cavity. The pia mater or inner membrane is hyperemic and the blood-vessels engorged. The gray matter varies from a gray to a pinkish color, and the white matter a yellowish-red. Between the brain and its covering membrane, and between the membranes themselves there is an abnormal amount of fluid; the brain substance itself is abnormally infiltrated with serum. In very severe hyperemia there may be ecchymoses or petechiæ present either in the substance of the brain or its membranes.

Symptoms.—The symptoms of active hyperemia of the brain vary, depending upon the severity of the engorgement and the degree of intracranial tension. In mild cases there may be only symptoms of restlessness shown, the animal frequently changing its position or wandering about in an aimless manner. Excitement and irritability may be seen with a tendency to bite, although the animal is not aggressive. In more severe hyperemia, there may be spasms and convulsions. The conjunctiva is congested, the pupil contracted and the expression vacant or staring. On palpation the head feels warmer than normal. The pulse and respirations are accelerated, appetite lost or variable and the animal may vomit. These symptoms appear quite suddenly but do not persist for long periods. They may disappear in a few hours or may last as long as three or four days.

The symptoms of passive hyperemia are chiefly those of depression, although these may alternate with periods of excitement.

Diagnosis.—Except for its shorter course and less severe symptoms, hyperemia of the brain cannot be differentiated from encephalitis, the symptoms being identical.

Prognosis.—The prognosis should be guarded, as even apparently mild cases terminate fatally through inflammation of the brain, a common sequel.

Treatment.—*Dietetic.*—As the animal will not usually take food during the acute stage and forcible feeding aggravates the symptoms, only fresh milk and plenty of fresh water should be offered at frequent intervals. Keep the patient in a cool, quiet, dark place, away from noise and exciting influences.

Medical.—In the early stages mild revulsives may be administered, the object being to divert the blood from the head to the intestinal tract. Magnesium sulfate (8. to 10.) may be given for this purpose or pilocarpine (0.00324 to 0.0081), the latter subcutaneously. If the excitement is intense and there are convulsions, morphine sulfate (0.0324 to 0.1944) may be administered subcutaneously. If the animal is depressed, narcotics should not be given, but cerebral stimulants administered: caffeine citrate (0.0324 to 0.1944) dissolved in normal salt solution or distilled water; camphor in the form of the spirit (0.5 to 1.) given subcutaneously, or, diluted *via* the mouth. Atropine sulfate (0.0005 to 0.001) is also useful as a cerebral and heart stimulant, subcutaneously. If the hyperemia is due to pressure from enlarged glands or tumors, these must be removed according to the rules of surgery.

Surgical.—If the animal is strong and plethoric, venesection may be performed on the saphena veins withdrawing from 3 to 6 ounces of blood. Cold applications to the head in the form of cold packs or ice-bags are useful but only in the earliest stages, and should not be employed if the animal is depressed. After convalescence is established, feed lightly giving laxative foods, as mush and liver or oatmeal and milk.

ANEMIA OF THE BRAIN—CEREBRAL ANEMIA

Definition.—Anemia of the brain is a condition in which there is a marked decrease from the normal in the amount of blood in the brain and its membranes. It may be acute or chronic.

Etiology.—Acute anemia of the brain may follow severe hemorrhage, or the too rapid withdrawal of fluid from the abdominal or thoracic cavities as in paracentesis. It may occur in thrombosis of the carotid arteries or in cardiac diseases, as stenosis or valvular insufficiency.

Chronic anemia of the brain is seen in chronic constitutional diseases, and in diseases affecting the blood, as general anemia and leukemia. Helminthiasis is a common cause.

Pathology.—The brain and its coverings are pale and the vessels quite bloodless. The cortex which is normally pinkish-gray in color is almost white and on section of the brain mass appears to be fused with the underlying white mass, the line of demarcation being indistinct.

Symptoms.—In acute anemia of the brain, the symptoms appear quite suddenly and vary from a slight dizziness to complete insensibility. The pulse is small and weak, the respirations may be slow and labored or accelerated. The mucous membranes of the head are very pale. The pupil of the eye is dilated. There may be convulsions from which the animal gradually recovers or these may be followed by death. The symptoms of chronic anemia are milder and in cases which progress slowly, no symptoms of either motor or psychic disturbances occur.

Prognosis.—Depends on the direct cause and the possibility of its removal.

Treatment.—*Medical.*—In acute anemia of the brain, the treatment is stimulative. Any of the cerebral stimulants, as caffeine citrate (0.0324 to 0.1944) subcutaneously, alcohol (2. to 4.) diluted, if the animal can swallow, or aromatic spirit of ammonia (2. to 4.) well diluted.

Surgical.—Artificial respiration and massage should be practised if the patient requires it. Clysters of normal salt solution are also beneficial, or the solution may be given intraperitoneally.

Chronic anemia of the brain must be treated by removing the primary cause and treating the general anemia by the administration of tonics, particularly the hematinics (iron and arsenic preparations). Also prescribe a full, rich diet.

MENINGO-ENCEPHALITIS

Definition.—This is an inflammatory process affecting the brain and its covering membranes. It may be suppurative or non-suppurative. The writer's reason for combining meningitis and encephalitis is, that in practice these diseases cannot be differentiated during the life of the animal, and when one exists the other is present at least to some extent. Furthermore, the treatment is essentially the same.

Etiology.—Meningo-encephalitis is caused by practically the same factors that produce hyperemia of the brain. These are: violent exercise, excitement, blows or concussions on the head. Excessive heat, direct sunlight etc., are thermic causes.

Infectious diseases, as rabies and distemper, are at times accompanied by meningo-encephalitis as are suppurative diseases of the auditory canal (otitis) frequently seen in the rabbit and occasionally in the dog. Other causes are metastatic emboli from infected internal organs at the uterus, lungs, heart (endocarditis) and mammary glands (tumors). This condition also follows severe enteritis and injudicious worming.

Pathology.—In meningo-encephalitis lesions of various size and character may be seen depending upon the cause, and may be formed anywhere in the brain or on the membranes. There may be numerous inflammatory areas or perhaps only one. Usually hemorrhagic, circumscribed or diffuse areas are noted either on or within the hemisphere, or on the cerebral membranes. The color of the areas varies from a dark brown to a greenish-yellow, depending on the age of the lesion. In those cases caused by metastatic emboli, suppurative areas may be found in any part of the brain and are usually multiple.

Symptoms.—As in hyperemia of the brain, there are symptoms of psychic or motor disturbance, or both. Early there is restlessness and timidity, and the dog may howl or bark continuously. If unrestrained the animal will run or wander about in any aimless manner and frequently run against objects. The head is hot, visible mucous membranes congested, and the eyes have a vacant, staring expression. The pupils may show unilateral contraction or dilatation. While most text-books state that the pupils are contracted, the writer has observed that in most cases they are either dilated or unequal.

In severe cases of meningo-encephalitis, spasms and convulsions, followed by unconsciousness, are observed. The animal may gradually recover consciousness, or may die in one of these attacks. When the inflammatory areas are caused by metastatic emboli, the temperature is elevated about two degrees and there are symptoms of paralysis shown, the parts involved depending upon what portion of the brain is affected. Deafness and blindness are not uncommon, showing involvement of the cranial nerves.

Diagnosis.—Meningo-encephalitis, except for its longer course, cannot be differentiated from acute hyperemia or congestion of the brain. None but the layman would confuse it with rabies (see Rabies).

Prognosis.—The prognosis is unfavorable unless less than 20 per cent of cases fully recover. The others usually die within a few days or become chronic "dummies."

Treatment.—The treatment of meningo-encephalitis varies in no way from that of hyperemia of the brain.

CEREBRAL HEMORRHAGE (APOPLEXY)

Definition.—This is a hemorrhage involving usually the cortex of the cerebrum, though it may occur in any portion of the brain.

Etiology.—Cerebral hemorrhage is most frequently seen in old dogs in which there is some degenerative process in the walls of the afferent blood-

vessels of the brain. It is also seen in distemper and in the arteriosclerosis which may follow rheumatism. These are predisposing causes. The direct causes are anything which raises the blood-pressure, as excitement, violent muscular exercise, etc.

Pathology.—The hemorrhage occurs usually in the cerebrum from rupture of a capillary. If the hemorrhage is near the surface the membrane covering the brain at that point will be distended and the convolutions will be depressed or flattened.

The site of the lesion may contain blood, hemoglobin or a serous fluid, depending upon the age of the lesion.

Symptoms.—These appear suddenly, usually after play or excitement and are those of paresis or paralysis. The animal drops to the floor or ground and is convulsed with muscular spasms. These may pass off and the animal will rise and walk about in an unsteady manner, or may lose consciousness. The conjunctiva is reddened, and the heart beat rapid. The respirations are slow and regular or they may be stuporous and irregular, of the Cheyne-Stokes' variety. The temperature is about normal.

If the animal does not die at once, it is usually left with a partial or complete paralysis, monoplegic or hemiplegic in character, depending upon the size and location of the hemorrhage. If the hemorrhage is small and away from the cortex, there will be only slight convulsions shown followed by muscular incoördination, the animal stumbling or staggering from side to side and falling.

Diagnosis.—The sudden occurrence, the history, the character of the respiration and the paralysis make the diagnosis not difficult.

Prognosis.—The prognosis should be unfavorable, only the milder cases terminating favorably.

Treatment.—Place the animal in moderately cool, well-ventilated quarters away from exciting influences. Cold applications should be applied early to the head, and if there be convulsions, antispasmodics (morphine, 0.0162 to 0.1944) may be administered. Give potassium iodide (0.1 to 0.8) to reabsorb the hemorrhagic exudate, and keep the bowels open with mild purgatives, such as castor oil (15. to 40.). Later the paralysis may be treated by the administration of strychnine to almost the toxic point (0.00054 to 0.00216). The faradic battery is also useful in treating the paralysis.

As this condition is brought about by a high blood-pressure and is most commonly seen in plethoric animals, it is well to reduce the blood-pressure by depletion methods, such as a restricted diet and occasional bleeding from the saphena vein, to prevent another attack.

TUMORS OF THE BRAIN

Tumors of the brain are rare in small animals but are occasionally observed. They may involve any part of the brain and its covering membrane, and histologically may be of any type.

The symptoms produced depend upon the location of the tumor and the degree of intracranial tension. They may be those of paralysis, muscular incoördination, rolling or turning movements, deafness or blindness. Unless the symptoms indicate that the tumor is located near the cortex or involves the membranes covering the brain, treatment, which is purely surgical, should not be attempted.

CHAPTER II

DISEASES OF THE SPINAL CORD

General Considerations.—*Functions of the Cord.*—Briefly stated, the functions of the spinal cord are: (a) a conductor of nerve impulses from the intracranial nerve centers to the periphery (skin and muscles), and from the periphery to the center; (b) it is the great reflex center for muscular coördination, and also contains in the anterior part special reflex centers, which control respiration, the circulation and deglutition, and in the lumbar portion are the centers for defecation, micturition, etc.

Examination.—The cord, like the brain, cannot be examined directly on account of its sheltered position within the vertebral canal, but diseases of the cord can, in a general way, be recognized by examining its functions. This is done by essentially the same methods as are employed in making an examination of the brain.

It is difficult in some cases to differentiate between diseases affecting the cord and those affecting the brain, but since the cord is the seat of the reflex action, diseases affecting it will, in many cases, destroy one or more of the reflex arcs depending upon what particular part of the cord the lesion occurs in. Therefore, all reflex action will be absent or modified posterior to the lesion. This, together with the fact that in diseases or lesions involving the cord alone no psychic disturbances, as a rule, are present, will serve to differentiate between them.

MENINGOMYELITIS

Definition.—This is an inflammation of the spinal cord and its covering membranes. It is quite common in the dog and rabbit but rare in the other small animals.

Etiology.—*Mechanical.*—Common causes of meningomyelitis are traumatic injuries, such as blows in the region of the back or loins, being run over by vehicles, etc.

Infectious.—It is also seen during or following the infectious diseases as distemper, rabies, pyemia, etc., and abscesses in the region of the spine, the pus burrowing between the vertebræ and attacking the meninges and cord occasion it.

Pathology.—The membranes covering the cord are somewhat thickened and show either diffuse or circumscribed areas of inflammation, and may be adherent to the cord itself. In other cases, depending on the cause, abscesses may be found involving both the membranes and the cord. If the condition is due to traumatic causes, the vertebræ may be broken or splintered with some portion pressing on the cord. The spinal fluid is increased in quantity and may be purulent in character.

Symptoms.—The symptoms of meningomyelitis, unless of traumatic origin, appear gradually and become more severe as the disease progresses. They may vary from slight motor and sensory disturbances to complete paralysis. There is slight twitching of the extremities which is usually the first symptom noted.

Disturbances of sensation are frequently observed as hyperesthesia, the animal showing pain when handled or even when stroked with the hand. Symptoms of paralysis are seen later, except when due to severe traumatic causes, when they may be the first and only symptoms shown. The patient has a staggering gait, sways from side to side when walking and finally drags its hind limbs. When placed on its feet, it will drop sideways on its hind quarters.

If the lesion in the cord is far forward, the anterior limbs may also be involved. If in the cervical region, however, death usually follows suddenly from respiratory arrest.

The sphincters of the anus and urinary bladder are usually involved, causing the feces and urine to pass involuntarily, though there is usually constipation. Progressive paralysis indicates tumors pressing on the cord. If only the membranes covering the cord are involved, the spinal reflex is present and may be exaggerated. If a portion of the cord itself is destroyed, reflex movement is absent posterior to the lesion. Consciousness is not disturbed.

Diagnosis.—It is usually not difficult to differentiate between diseases of the spinal cord and those of the brain, but to state definitely the character of the lesion and its exact location should not be attempted. In diseases of the nervous system it is generally sufficient to state whether the brain or cord is affected.

Prognosis.—In meningomyelitis, as in other diseases of the brain and cord, the prognosis is generally unfavorable, only a small percentage recovering.

Treatment.—In the early stages give laxatives, as magnesium sulfate (8. to 12.) or castor oil (15. to 40.) and apply counterirritants to the spine.

The faradic battery is useful in treating the paralysis, or strychnine almost to the point of intoxication. Iodide of potassium may be given to reabsorb the exudate.

The animal should be placed under good hygienic surroundings and kept clean and dry.

of the cord may thus be either partially or entirely lost and the function of the nerves will be partially or completely destroyed in the area involved. In minor injuries with simple edema of the membranes or cord the development is gradual and the degree of involvement very slight.

Symptoms.—The symptoms of compression or injury to the spinal cord will depend upon: (a) the location of the injury or portion of the cord affected; (b) the degree of compression or destruction of the cord. When the spinal cord is compressed or crushed in the cervical region the animal, as a rule, does not live over a few minutes or hours. Complete paralysis is observed posterior to the point of injury. The patient may be able to bring the muscles of the head into action for a short period preceding death. In cases of lesser injury or compression the symptoms are not so pronounced and the patient may be able to move certain groups of muscles. If the compression is due to edema of the membranes or hemorrhage into the cord or canal the symptoms are milder and gradually disappear in the course of a few days or weeks.

Complete destruction of the cord posterior to the cervical enlargement will produce paralysis and complete loss in sensation in the limbs, tail and body. This is noticeable in the respiration as the ribs remain fixed and the respiratory movements are confined to the diaphragm.

There may be retention of urine and feces, or they may be voided involuntarily.

When the dorsal portion of the spinal cord is affected there will be paralysis of the posterior part of the body. In slight injury or compression there may be only incoördination of movement from the point of injury.

Compression or destruction of the anterior part of the lumbar segment results in paralysis and anesthesia of the hind limbs, tail and muscles of the group. When the injury is in the middle or posterior portion of the lumbar segment the symptoms will be modified somewhat owing to the injury of the sacral segment which results in paralysis of the area supplied by the sciatic nerve. The sphincters of the bladder and anus respectively will be paralyzed and urine and feces discharged involuntarily.

When the injury occurs in small animals spasms of adjacent muscles will be observed. This is due no doubt to the injury producing stimulation to the nerve roots. On examination of the patient the temperature is often elevated, or it may be subnormal if the sphincters are relaxed and the thermometer inserted in the rectum. Palpation over the region of injury will cause the animal intense pain and frequently convulsions or spasms. Swelling is often present and crepitation may be detected. Abnormal movement of the vertebræ involved can be determined in the cervical and lumbar segments.

Diagnosis.—This is accomplished only after careful examination and consideration of the parts paralyzed. The determination of the degree of injury is often very difficult. There might be a complete paralysis resulting from edema and hemorrhage greatly resembling cases of destruction of the cord. However, the history of the case will assist in the differential diagnosis.

Course.—In complete destruction of the cord in the cervical segment death may occur in a few moments or may be delayed for several hours. Should there be hemorrhage only and partial paralysis the patient may live for several days and some will make a complete recovery. In involve-

ment of the dorsal and lumbar segments the course will depend upon the degree of injury. In small animals they may live for several weeks or months.

Prognosis.—A definite prognosis is often difficult to arrive at on account of the impossibility to determine the degree of injury in all cases. When there is evidence of complete destruction of the cord the case is hopeless. In cases of hemorrhage or edema most patients will make a complete recovery. At best the prognosis should be held in reserve until the exact condition can be determined.

Treatment.—No treatment will be of any value where the spinal cord is destroyed. If crepitation is present and distinct separation and movement between the involved vertebræ are detected it is advisable to destroy the animal. If in doubt in regard to the actual condition the patient should be given a soft bed and quiet place. Good nourishing food (meat, milk) and gentle massage over the region injured will assist in the resorption. In the secondary stages small doses of strychnine-sulfate (0.001) daily and electricity have proved to be beneficial.

Symptoms.—The rigidity of the spine and the careful way in which the animal lies down and gets up are somewhat characteristic. Dogs exhibit considerable pain on moving the spinal column by whining, crying, etc. In movement the animal is very cautious and often if recumbent refuses to arise when called. Examination of the patient reveals the rigid condition of the spine and the fixation of the muscles of the back. Forced movement of the vertebræ induces severe pain. Paralysis gradually develops posterior to the point of compression; sensation is partially or completely destroyed, and involuntary passage of urine and feces follows from paralysis of the sphincter muscles concerned.

Diagnosis.—An early diagnosis is often difficult owing to the gradual development of the primary condition. A careful examination of the vertebral column, its rigidity, evidence of pain on movement, will assist in the diagnosis. It may be confused with muscular rheumatism.

Prognosis.—This must be considered unfavorable in all cases. Recovery is very rare.

Treatment.—Treatment is practically impossible. Operable tumors, when its cause, may be removed surgically. Abscesses may be opened and drained, but owing to the complicating infection little can be expected in the way of recovery or even improvement. No internal treatment has proved of any value. Small doses of potassium iodide may be tried in the milder cases.

CHAPTER III

DISEASES OF THE PERIPHERAL NERVOUS SYSTEM

INJURIES OF THE PERIPHERAL NERVES

SMALL animals are subjected to a variety of injuries which may involve the individual nerves or nerve endings, such as bruises of the muscles, in which the nerve is crushed against the bones, or between muscles, or stretched or torn or the nerve is cut by sharp objects which is more frequent.

PRESSURE UPON THE PERIPHERAL NERVES (COMPRESSION)

Most frequently compression results from neoplastic formations (sarcomata, neuromata), from hemorrhagic extravasations, serous effusions into the tissues, enlargement of lymph glands, fractures of bones or abscess formation.

Neuritis undoubtedly occurs in small animals, particularly in dogs, and may result from a variety of causes. Chilling or subjection to extremes of temperature is perhaps most productive of the condition. The inflammation resulting is subsequently followed by paralysis in a number of cases.

This can be easily determined in most cases by noting the extent of the paralysis.

Prognosis.—When there is complete paralysis of central origin it is considered unfavorable. However, if the condition has only temporarily affected the nerve the animal will recover. The exact condition of the nerve is impossible to determine. In the peripheral form the condition of the nerve at the point of injury is important. When not destroyed the prognosis is favorable.



FIG. 21.—Facial paralysis.

Treatment.—In the peripheral form due to injury or chilling, the symptoms usually disappear quite promptly. The parts should be massaged thoroughly and the electric current applied daily over the region. Stimulating liniments massaged into the tissues are recommended (soap liniment, camphor liniment, white liniment). If tumors or abscesses are present they should be operated at once, care being taken to avoid injuring the nerve. In the central form nerve stimulants (strychnine sulfate 0.001 daily), or electricity should be employed. Usually in the course of ten days to two weeks improvement will be noticed. If after one month to six weeks no improvement is noted the chances are that the nerve trunk has been completely destroyed and further treatment is useless. Spasm of the muscles supplied by the facial nerve occurs occasionally, especially in dogs, no doubt due to the infection from distemper producing irritation to the nerve. It may also occur in meningitis and encephalitis. When present the condition is characterized by clonic convulsions of the muscles

supplied by the nerve. Sedatives would be indicated to reduce the irritation.

Trigeminal Nerve.—Paralysis of this nerve is observed most often in dogs.

Etiology.—(a) Rabies produces the greatest number of cases. Therefore, all cases of trigeminal paralysis should be handled with caution until the exact cause is known. (b) Occurs in some cases from distemper. (c) Inflammation of the brain and concussion of the brain also cause it. (d) Injuries in which the motor branch is pressed or crushed. This happens not uncommonly in dogs from extreme opening of mouth, or carrying large heavy objects in the mouth. (e) Tumor formations, such as sarcomata in close proximity to the nerve, or abscesses. These conditions may either injure the nerve directly or by external pressure. (f) Rheumatic conditions involving the muscles supplied by the nerve. (g) Neoplasms at the base of the cranium (angioma).

Symptoms.—The most pronounced symptom is dropping of the lower jaw, the mouth remaining open constantly. In such cases rabies should be suspected. In unilateral paralysis the animal may be able to close the mouth and masticate on one side. If all three branches of the nerve are paralyzed mastication and sensibility are lost. In case any individual branch of the nerve is paralyzed that part supplied by that branch only will be affected. When the mouth remains open the tongue will protrude, become dry and discolored. Saliva is usually profuse and flows from the open mouth. Attempts at eating and drinking fail. Food is swallowed when placed back in the mouth.

tically all cases, however, it is the result of inflammatory changes within the middle and inner ear. These changes may result from chicken pest, cholera, epitheliosis, contagious rhinitis (rabbit), or distemper. Causes of minor importance are: concussion of the brain, hemorrhages in the middle ear, or caries of the petrous portion of the temporal bone.

Symptoms.—Deafness is the pronounced symptom of paralysis of the cochlear nerve. If bilateral and complete the animal will be totally deaf. In vestibular paralysis, when unilateral, the patient will assume a peculiar attitude holding the head downward and toward the normal side. In dogs and rabbits rolling movements are very prominent symptoms. This is so marked in some cases that it is impossible to hold the animal. The least irritation or disturbance will cause them to show it. Rolling movements always take place toward the normal side. Attempts at walking are difficult but if they succeed will travel in circles, often falling down and rolling over and over. The eyelids are often closed and the eyeball assumes an abnormal position. In case of bilateral vestibular paralysis, the head drops down and the muscles of the neck are limp.

Diagnosis.—This should not be difficult, as the symptoms of deafness are easily manifest and the peculiar movements of the animal in vestibular paralysis are characteristic.

Prognosis.—Should be considered unfavorable except when due to injuries.

Treatment.—If due to injuries the animal should be kept quiet and if necessary fed artificially in order to maintain its general condition. The ears should always be examined to determine their condition (disease or parasites). Pigeons, when affected, are isolated and the premises disinfected to guard against contagious meningitis. Internal administration of magnesium sulfate or castor oil as a laxative is advised. No treatment can be applied direct to the seat of the condition.

Radial Nerve.—Paralysis of this nerve occurs occasionally in the dog and cat.

Etiology.—(a) On account of the position of the radial nerve it is easily injured by traumatism. Animals struck by objects, falling, jumping, etc., very commonly injure the nerve with resulting partial or complete paralysis which may be temporary or permanent. (b) May follow muscular rheumatism or subjection to cold. (c) Follows infectious diseases, such as distemper in dogs and cats. (d) Has been observed from injury to the spinal cord. (e) Tumors and abscesses in the muscles may bring about at least a temporary radial paralysis.

Symptoms.—The radial nerve controls the muscles that extend the forelimb; therefore the most prominent symptom is inability to carry the limb forward. The joints are all relaxed. The animal in moving forward drags the toe on the ground and weight cannot be supported owing to the difficulty of properly placing the limb in the normal position. Some weight will be supported on the limb when it is placed in position. The degree of disturbance will depend upon whether the paralysis is complete or partial. Local examination reveals absence of inflammatory changes. There is usually a normal degree of sensitiveness in the skin.

Diagnosis.—A careful examination should be made in the dog for they are inclined to favor the limb in the least disturbance. However, in many cases of injuries, the limb will be carried from the ground while in this case

it will be just the opposite, dragged on the ground. Examine for thrombosis of the axillary arteries.

Prognosis.—The large number of cases recover. This is explained in that most cases result from injuries which do not seriously disturb the structure of the nerve. Few cases will be permanent.

Treatment.—Massage the muscles and stimulate them by the use of the electric current. Nerve tonics may also be given. If no improvement is apparent in ten days to two weeks the case should be considered unfavorable. Amputation of the limb at a point sufficiently high so as to prevent contact with the floor or ground thus avoiding severe wounds is sometimes indicated.

Brachial Plexus.—Paralysis of the brachial plexus occurs most commonly in the dog and cat.

Etiology.—The majority of cases result from injury, from falling or jumping from great heights. Fracture of bones adjacent to the plexus resulting in injury will produce it. Tumor formations and abscesses in the axillary region are also causes.

Symptoms.—The most prominent symptom is a limp, lifeless condition of the limb unable to support any weight. Sensation, as a rule, is lost in the entire limb. If the paralysis is partial only, the symptoms will be less prominent.

Prognosis.—Most cases, inasmuch as they are due to injuries, recover completely in the course of a few weeks.

Treatment.—Massage and nerve stimulants are useful. Keep the animal well nourished.

Sciatic Nerve.—**Etiology.**—(a) Falling from heights and jumping. (b) Wounds and direct injuries to the nerve. (c) Infectious diseases (distemper). (d) Tumors and abscesses in contact with the nerve.

Symptoms.—There will be paralysis of the biceps femoris, the semitendinosus and the muscles below the stifle joint. In the dog the limb will hang relaxed and during forward movement the toe is dragged on the ground. Cases will be seen where the hair and skin are abraded from the anterior surface of the foot. There may be loss of sensation below the stifle joint. In bilateral sciatic paralysis it resembles lumbar paralysis to a certain degree. A differentiation should be made. Atrophy of the affected muscles will soon be noticeable.

Prognosis.—If due to injuries it is favorable, provided the nerve is not completely destroyed.

Treatment.—Massage and employ nerve stimulants. Protect the feet from injury, give nourishing food and use the electric current.

Paralysis of other nerves is occasionally seen but is of minor importance.

CHAPTER IV

FUNCTIONAL NERVOUS DISEASES

VERTIGO (MEGRIM)

Definition.—A condition characterized by dizziness and general disturbance of equilibrium (swooning). In small animals it is not very commonly observed, except in dogs and rabbits.

Etiology.—In these animals the condition is very seldom found as a primary disease. It is usually secondary to other diseases which it may follow.

(a) Diseases of the brain, such as hyperemia, acute and chronic, or encephalitis, often produce the symptoms of vertigo. (b) Tumors, hemorrhage into the brain or membranes, concussion of the brain, or emboli of some of the cerebral blood-vessels may also produce it. (c) Defects of vision, or irregular lighting in which too sudden change takes place in the accommodation of the eye, have been cited as causes. (d) Diseases of the middle or inner ear. (e) Sudden change in the circulation of the blood in which there is cerebral anemia. Tight collars may produce the condition, or the dog pulling steadily on the leash may bring it about. (f) Reflex conditions from the intestinal tract (parasites or intestinal catarrh). (g) From poisoning, such as ptomaines, certain poisonous plants, or overdoses of alcohol and other narcotics.

Symptoms.—The early indication of vertigo is characterized by a sudden staggering gait. The animal falls down, becomes unconscious. It remains in this position quietly for a few moments, arises and soon assumes its normal condition. The individual attack is usually of short duration, from two to ten minutes. The time elapsing between the attacks is variable. The prodromal symptoms are anxiety, staring expression, increased respiratory movements, and sometimes slight twitching of the muscles.

Diagnosis.—A differential diagnosis should be made between vertigo and epilepsy. The main differential feature is the absence of convulsions in vertigo. The symptom vertigo is not so difficult to determine, but its causes may remain quite obscure.

Prognosis.—Should not be considered very favorable as the cause is hard to determine. Individual attacks of the disease usually do not cause any serious disturbance barring accidents and injuries.

Treatment.—During an attack of vertigo the animal should be placed in a comfortable, quiet place and protected from injury. Following the attack the examination should be directed to find out the underlying cause and treatment applied accordingly.

EPILEPSY

Definition.—Epilepsy is a disease of the central nervous system which is characterized by convulsions occurring at irregular intervals, the subject usually being unconscious during the attack.

Etiology.—The cause of primary true epilepsy is unknown although it is regarded as being hereditary; at least the offspring of epileptic parents are

markedly predisposed to the disease. This has been observed in man as well as in the domesticated animals.

Pathology.—No postmortem lesions of any kind have been observed either in animals or man which would account for the disease.

Symptoms.—In epilepsy the attacks come on suddenly, the animal performing uncontrollable movements. This is followed by the subject falling to the ground or floor and in convulsions of a clonic type. Generally every muscle is involved, including the facial muscles. There is champing of the jaws with salivation, the saliva being churned into foam and often blood-stained due to injuries of the tongue by the teeth. The visible mucous membranes are cyanotic; the heart beat is full and strong, and the respirations suspended. The convulsions last but a few seconds and gradually become weaker and finally cease. The animal lies quietly for a few minutes, then rises to its feet, staggers and finally recovers. The attacks do not occur at regular periods. The animal may have two or more in a day, or there may be weeks or months between attacks.

Diagnosis.—It is difficult to differentiate between true epilepsy and secondary or reflex epilepsy which is merely a symptom of some other disease. A history of chronicity and the rather long periods between the attacks point to true epilepsy. Further, true epilepsy may be seen in both old and young animals while secondary or reflex is usually confined to the young.

Prognosis.—The prognosis is unfavorable, as true epilepsy is considered incurable.

Treatment.—If treatment is undertaken, the bowels should be kept open by feeding laxative food and, if necessary, the administration of laxative drugs as cascara sagrada, fluidextract (2. to 8.), or sulfur (2. to 6.) in the food as required.

The periods between the attacks may be lengthened by the administration of bromides in full doses, the bromide of sodium being preferable (0.5 to 4.).

Castration is said to have a beneficial action in some cases.

Reflex or Secondary Epilepsy.—This is seen as a symptom of several diseases occurring in small animals and somewhat resembles true epilepsy.

Reflex or secondary epilepsy is sometimes seen in rickets, inflammatory diseases of the digestive tract, some infestation with internal parasites, during the eruption of the permanent teeth, in constipation, and frequently distemper, especially the nervous form.

It is seen chiefly in young animals, being quite rare in older, while true epilepsy affects the old as well as the young. This will assist in the differentiation between reflex and true epilepsy.

Treatment.—Treatment must be directed toward the primary disease or condition producing the symptoms.

Etiology.—The cause of catalepsy is not known, though it is probably of reflex origin.

Pathology.—No pathological lesions of the central nervous system have been demonstrated. Degenerative changes in the muscles have been observed, also small hemorrhages in the stomach and intestines, but these are not constant.

Symptoms.—The attacks come on rather suddenly, the animal becoming rigid, muscles hard and tense. The eyes are fixed and dull in appearance, the pupils may be dilated or contracted to the utmost. Sensation seems to be inhibited during the attack. The circulatory and respiratory functions are undisturbed; temperature normal. If the position of the animal's limbs be passively changed it will remain in that position for a long time.

Diagnosis.—This is made chiefly by passively changing the position of the body of the animal or its limbs. If it remains in this position without change for a considerable length of time, the attack is undoubtedly catalepsy.

Course.—The course of the attacks is from four to twenty-four hours from which the animal usually recovers.

Prognosis.—The prognosis is not unfavorable, though the attacks may recur.

Treatment.—The administration of antispasmodics is indicated. Give morphine (0.032 to 0.2) subcutaneously, or chloral hydrate (2. to 4.) in emulsion per rectum. This will relieve the attack, but there is a tendency to recurrence.

CHOREA

Definition.—This is a persistent clonic spasm, or twitching of certain muscles, or group of muscles. It is more often seen in the dog; rare in other animals.

Etiology.—Chorea results most frequently from acute infectious diseases as distemper to which it is a common sequel. It also occurs in myelitis, and in the early stages of rachitis.

Pathology.—There is no demonstrable lesion observed even in the most careful examination which might account for the symptoms shown. Anemia is the most constant.

Symptoms.—The twitching of the muscles is quite constant and usually involves those of the head and anterior limbs, though often one or both of the pelvic limbs may be involved. There is a peculiar dipping movement of the head and shoulders. Often the masseter muscles are the only ones involved producing a spasmodic movement of the jaws. Consciousness is not disturbed.

These rhythmic spasms are less marked when the animal is alone and during sleep. The pulse and temperature are normal; the appetite unaffected. The disease is chronic and may persist for months or years. Young animals frequently recover without treatment.

Diagnosis.—Diagnosis is not difficult. The history, the peculiar rhythmic spasms of certain muscles, and the absence of general symptoms point clearly to chorea.

Prognosis.—Prognosis is good so far as the life of the animal is concerned, but bad from the standpoint of recovery or cure.

Treatment.—Many kinds of treatment have been tried but none have given decided results. Arsenic in the form of Fowler's solution (0.1 to 0.75) once daily has proved helpful.

Recently sodium cacodylate has been administered experimentally with excellent results. The animal should be given nourishing food, and if anemic, iron preparations as iron and quinine citrate (0.2 to 0.7) are useful.

Occurrence.—The condition in mind is of somewhat recent occurrence. It is at the present time rather widespread in the United States. Dogs of all ages, except perhaps very young puppies, are susceptible.

Etiology.—So little is known of the condition that it must be admitted that the exact cause is as yet unknown. Many theories have been advanced such as follows: specific infection, intestinal parasites, distemper, abscessed anal glands, certain kinds of prepared dog food and deficiencies in diet. Later research seem to indicate that the condition may be produced by a virus.

Certain things seem to serve as predisposing factors such as exercise, excitement, pleasure at seeing the owner, being offered food or sharp noises of any kind.

Pathology.—No marked pathology has been found except congestion of the brain, cord and their coverings. In some cases there seems to have been an excess of spinal fluid.

Symptoms.—The early symptoms usually consist of signs of restlessness, a stary expression of the eyes or slight movement of the jaws.

If confined to a room or house the animal may suddenly begin to bark or yelp, running from place to place and possibly seek a location in which to hide. A person hearing such an animal, but not being able to see it, would be led to believe that it was being severely abused. This is due to the peculiarity of the voice.

One of the outstanding symptoms is the wild expression or seeming fear. Animals may even turn the head as if looking at something of which they are afraid. It is probably because of such fear that they so often run as if being pursued.

Some cases attempt to climb the walls or the corners of the room or cage. There is champing of the jaws with saliva flowing from the mouth. Very often there is involuntary passage of feces and urine.

As the attack becomes more severe the animal may fall over on its side with legs constantly in motion. It may remain down only a short time, but after regaining its feet, seems weak, and may run into objects as if blind. Examination of the eyes at this time reveals a dilatation of the pupils.

Such attacks may be so frequent as to seem almost continuous, or there may be periods of weeks or months, during which the animal may seem perfectly normal. The more frequent the attacks the greater the possibility of a fatal ending.

There is no aggressiveness shown, however, when forcibly restrained some animals may bite, but seemingly in an effort to get free. Other animals may welcome being held or patted, in fact this seems very often to lessen the severity of the attack.

When occurring in dogs in the field the attacks may be ushered in by yelping, followed by the animal running away in almost a straight line. Later, it may return exhausted or become lost or even die as the result of the attack.

Diagnosis.—While nervous disorders in general are somewhat difficult to diagnose accurately, the symptoms of this disease are so characteristic as to cause little difficulty.

The symptoms of fright, peculiar distressed yelping, temporary blindness and the involuntary defecation and urination are the ones most to be depended upon as aids in making a diagnosis.

Prognosis.—Not particularly unfavorable so far as the life of the animal is concerned, but very unfavorable from the standpoint of complete recovery.

Animals have been known to have intermittent attacks over a period of several years.

Prevention.—As there is some evidence which points to the possibility of the condition being due to infection, it is advisable in the hospitalization of affected animals to keep them from coming in contact with other patients.

Treatment.—Since excitement, sharp noises, etc., serve as predisposing causes, animals should be kept as quiet as possible. Good elimination, *via* the digestive tract, is to be maintained either by the proper selection of the diet or by the administration of suitable laxatives.

Severe attacks of frequent occurrence may be controlled temporarily or made to occur less frequently by the use of such agents as chloral hydrate, barbital, etc. Yeast has been given a prominent place in the treatment, presumably correcting certain digestive disturbances and supplying essential vitamins. More data is necessary before definite results are substantiated. It is worthy of trial.

Some persons believing it to be due to a dietary condition claim excellent results by the use of a diet consisting of milk and raw lean beef. Others have obtained good results from or following the administration of calcium either orally or intravenously. It can be safely stated at the present time, that to our knowledge, there is no specific medicinal treatment for this disease.

symptoms. Internal disorders, especially digestive diseases favor the condition. Very often no assignable cause can be discovered.

Symptoms.—The disease occurs chiefly on the upper surface of the body, especially on the neck, under the collar and along the back. The hair coat is dull and dry and the skin is covered with small grayish-white scales or dust. Itching is sometimes present.

Diagnosis.—The presence of the scales indicates the condition, and only the absence of parasites distinguishes it from parasitic diseases.

Prognosis.—The disease runs a rather prolonged course but continued treatment usually effects a cure.

Treatment.—Good nourishment is necessary if digestive disturbances are suspected as the indirect cause. Internal treatment with digestive tonics, especially preparations containing arsenic for its action on the skin. The external treatment consists in cleaning applications with alkaline solution (sodium carbonate, 2 per cent) and application of salicylic ointment (10 per cent). A solution of resorcin (5 per cent) is very satisfactory as it does not soil the hair coat, nor cause dirt to adhere to it. It is best to clip the hair and brush the skin well before medicinal treatment is begun, and thereafter at frequent intervals.

ALOPECIA

Definition.—A loss of hair, or fur from large or small areas due to causes other than organic diseases or parasites.

Etiology.—*Mechanical.*—Female rabbits pull out their fur for use in preparing a nest for their young.

Chemical.—Acids or strong caustics by deep action on the skin will destroy the hair follicles and when healing occurs the area is free of hair.

Thermic.—Hot water, often intentionally applied, may act deeply enough to destroy the follicles and denude an area. Burns appear similar but more diffuse.

The most common cause is deranged nutrition to such an extent that the hair falls out usually in patches over the body. A single area, so affected, and when the usual etiological factors are wanting, must be ascribed to a disturbance of the atrophic skin nerves of that part. In one case the hair was lost each succeeding summer from pigmented parts of the skin. No cause could be given.

Pathology.—The hair appears to loosen in patches and fall out. The skin appears almost normal in some cases but usually somewhat dry and hard. In those cases following severe wounds, scalds, or burns, the skin shows scar formation. The microscopic examination for parasites is negative.

Symptoms.—There appear on the skin small areas denuded of hair, which gradually become larger. The hair at other parts can be readily pulled out. The skin of rabbits, when fur has been pulled out, appears apparently healthy. When due to wounds, scalds and burns, the skin is thickened, often scaly and the hair around the affected area often distorted from its usual direction of growth, appearing longer at the margins.

Diagnosis.—This is made by negative microscopic examination of skin scrapings, and inspection of skin for scars. Observing or inquiring into the habits of the animal affected, and a careful examination into its general condition are helpful.

Differential Diagnosis.—Alopecia must not be confused with demodectic mange, which frequently causes loss of hair in small but gradually enlarging areas.

Prognosis.—Good if due to general nutrition disturbance. If from scar formation the loss is permanent, as is also true of trophic nerve disturbance.

Treatment.—Treatment consists in giving good food in proper amounts, and stimulating metabolism by tonics, especially those containing arsenic for its alterative action on the skin. Scarified areas, if small, may be overcome by complete removal of the areas and the healthy skin approximated by suturing. Fur pulling of rabbits is not objectionable when their habits are known. It may be overcome in part by supplying proper material for bedding just before parturition.

DERMATITIS

Definition.—An acute or subacute, septic or aseptic inflammation of the skin. It may be local or general.



FIG. 22.—Non-parasitic dermatitis.

Infectious.—Infections of *Bacillus necrophorus*, especially in suckling young, produce serious necrotic sloughs of the skin. Secondary dermatitis is frequently seen during the course of distemper in dogs.

Pathology.—The mild, acute form reddens the skin, which becomes sensitive, but is otherwise little changed. The subacute form is shown by a thickening and hardening of the skin. The skin feels rough and fissured. Any serous or hemorrhagic discharge soils the hair and forms crusts. The microscopic examination for parasites is negative and the skin itself shows an increase of connective tissue and general infiltration often to the extent of separation of the layers.

Symptoms.—Pruritus is usually the first noticeable symptom which causes repeated scratching, rubbing on the ground or floor and licking the part. In hunting dogs, especially at the beginning of the season, the skin over the chest and anterior part of limbs, between the toes, and on the end of the tail, will be reddened and moist, often bleeding, while the dog is being used in the field. In dogs and cats following the use of strong or the too frequent use of bath soaps, a mild, acute, diffuse dermatitis ensues. Its persistence depends on the continuance of the causes. Sleeping on hard surfaces without bedding causes a chronic local dermatitis especially in large dogs, which appears in the form of a thickened, roughened, hairless area over the elbow (scleroderma). A persistent form of dermatitis occurs as a result of injuries to the edge of pendulous ears and the irritation induces frequent shaking of the head which serves to aggravate the condition. Fly bites on the ears to the extent of producing severe inflammation are common.

Diagnosis.—Negative microscopic examination with consideration of the several causes assists in making a diagnosis.

Prognosis.—Good, especially in acute conditions when the causes can be removed.

Treatment.—Mild acute forms may be treated successfully with the application of lead water or drying powders. When crusts have formed, soiling the hair, a cleansing wash of a sodium carbonate solution (5 per cent) repeated daily is very good and will relieve the itching usually present in this form. Chronic forms necessarily require longer treatment with preparations to soften the skin as lanolin or ichthyol ointment. The chronic form which occurs on the edge of pendulous ears can be successfully treated only by bandaging which prevents the animal shaking the ears. The bandage should be so applied that the affected tips are exposed for treatment with creolin ointment. This aids healing and prevents further injury from fly bites, the most usual source of this trouble. If the ears are very much thickened it may be advisable to remove the edges evenly and immobilize until complete healing occurs. Gangrenous dermatitis requires prompt treatment by removing the affected parts of skin and applying strong antiseptics.

ACNE

Definition.—An inflammation of the glands of the skin with enlargement, appearing as small nodules in the skin. Quite frequently they pass on into pustules.

Etiology.—Irritation of the glands by rubbing, or by the collar, or when there is an obstruction to the glandular openings by accumulations of dirt

or medicinal substances which have been applied. Preparations, as creolin, continued for a time may produce inflammation of the glands. The bacteria always present in the skin find favorable conditions in an obstructed gland and soon convert it into a pustule. Acne is secondary to an invasion of the hair follicles and glands with parasites. (See *Demodex Mange*.)

Pathology.—Small elevations appear on the skin. They may be scattered or appear in groups. As the condition advances a few show a change to pustular form.

Symptoms.—Small, round elevations varying in size up to that of a pea appear on above-mentioned parts of the skin. Inflammatory symptoms are present and the skin is quite sensitive. Small, clear vesicles appear and soon become turbid, rupture and their contents dry to form a scab. These scabs fall off and leave a small area denuded of hair for some time. Some nodules may gradually disappear in one to two weeks without disturbance of the skin or hair over them. All stages of the disease may be present at the same time.

Prognosis.—The prognosis is good. Recovery occurs in one to two weeks, either by pustular formation, rupture and escape of the contents, or by gradual reduction of the inflammatory process.

Treatment.—Thoroughly cleanse the affected parts of the skin with a warm alkaline solution; in the nodular stage salicylic ointment (5 per cent) may be used. As the nodules become softened the contents should be squeezed, after opening if necessary, and washed out with antiseptic solutions. Internally the administration of Fowler's solution is usually beneficial. The appropriate sulfa drugs may be used with benefit. The use of tar, phenol, sulfur or salicylic acid preparations is contraindicated in cases of acne due to chemical irritations of the skin as they usually aggravate the conditions. The use of autogenic vaccine has given good results in numerous cases. The ultra-violet lamp is also indicated.

Symptoms.—The early stages appear as an ordinary dermatitis progressing through the various stages of inflammation until the pustular eruptions occur. Recovery may occur spontaneously at this time, or with proper treatment, but if not it passes on to the eczematous stage. Pustules continue to form and discharge their contents often unnoticed, under the long hair and crusts. If sufficient to keep the skin moist it is commonly classed as weeping eczema. The itching is intense, and the frequent scratching, biting or rubbing removes the matted hair and crusts leaving a raw bleeding surface. The skin lesions may occur in one or more small areas or over a gradually increasing large surface. In consequence of continued efforts to relieve the itching by licking and scratching, the inflammation extends into the deeper layers of the skin. Healing occurs in three or four weeks with recurrence of the condition. The skin becomes thickened and fissured, and bleeds easily. Scales continue to form on these partly healed areas. Some of the hair bulbs atrophy or are destroyed and only a partial growth of hair reappears on the surface. A recurrence of the condition each succeeding summer is quite common in well fed house pets especially among well bred dogs with fine skins.

Diagnosis.—A diagnosis can only be made by the exclusion of parasitic conditions and the more acute forms of dermatitis and acne. Involvement of the ears in the form of otitis externa, as well as lesions between the toes, often assist in making a diagnosis.

Prognosis.—Favorable in the earlier stages, but when the skin becomes thickened, hard and fissured, healing is as a rule only temporary, as acute relapses occur. When occurring as result of a chronic internal disease the prognosis is especially unfavorable.

Treatment.—Carefully cleanse the affected parts, remove all the crusts and scabs possible, and clip any hair that may be over the part and for some distance around the margin. Mild soap may be used for washing, also alkaline solution (sodium carbonate 5 per cent). Upon the condition of the skin further treatment depends. If the surface is moist, drying powders can be used, such as talcum, zinc oxide, or boric acid. Liquid preparations of lead and zinc (Burow's solution) are also very good. Tannic and salicylic acid of each 5 per cent in alcohol often give good results. Proper internal treatment is important in all cases of eczema as has been shown by marked improvement from this form of treatment alone. Mild purgatives, especially calomel (0.06 to 0.12) or magnesium sulfate (8. to 12.), for their antiseptic and laxative action repeated at two- or three-day intervals. Fowler's solution (0.19 to 0.58) daily for dogs gives the best general results and should be continued for a long time. Calcium chlorate (15. to 30.) in solution daily acts to relieve the itching. A good diet of easily digested, non-irritating foods is essential. Brewers' yeast given daily is often very beneficial. In obstinate cases tissue extracts as are now available on the market may be injected subcutaneously at intervals of three to five days. This form of treatment often results in a distinct improvement of the condition. Ultra-violet light may also be used.

CHAPTER II

PARASITIC SKIN DISEASES

FLEAS

Description.—Fleas are large enough to be seen with the unaided eye, but magnification is necessary to distinguish the species. They are wingless insects, with laterally compressed bodies and measure from 2 to 4 mm. in length. Their covering is thick and dark brown in color. The legs are long, powerful, and adapted for leaping.

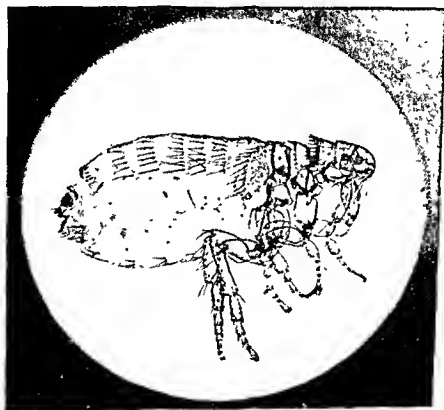


FIG. 23.—*Clenocephalides canis* (flea of dog).

condition, and irritated areas develop on the skin. Fleas are thought to be one of the causes of the so-called "summer eczema."

The dog flea (*Ctenocephalides canis*), cat flea (*Ctenocephalides felis*), and human flea (*Pulex irritans*) are intermediate hosts of the tapeworm *Dipylidium caninum*.

Control.—The control of fleas falls into two categories: (1) the destruction of fleas from the dog and cat, and (2) destruction of fleas in the home. The former involves periodic removal of the fleas from dogs and cats. This may be accomplished by the use of certain insecticides, such as, pyrethrum and derris powder, or 2 per cent creolin solution. Fleas from the dog and cat frequently attack man in the home and at times become quite a problem. In the destruction of fleas in a home, the bedding used by the animal should be sterilized, the floor coverings aired and cleaned, floors scrubbed, and all rubbish and dry organic matter, that may serve as breeding places, removed. Immature fleas may be destroyed in the house by treating floors and floor coverings with naphthalene. Barns, cellars and ground near and beneath buildings, after removal of rubbish, may be sprayed with creosote oil or crude petroleum.

LICE

Description.—There are two types of lice that infest domestic animals, the sucking louse and the biting louse. The members of these two types resemble each other in most particulars but differ in their feeding habits. The sucking lice feed upon the blood, while the biting lice feed upon scales and other products of the skin. Neither type have wings, the legs are adapted to cling to hairs and the bodies are compressed. The biting lice are usually more active than the sucking lice. The sucking lice have elongated heads with protrusible proboscises at their tips, while the heads of the biting lice are short and broad and have a pair of distinct mandibles situated on their ventral parts.

Dogs are infested with two species of biting lice (*Trichodectes canis* and *Heterodoxus longitarsus*) and one species of sucking louse (*Linognathus piliferus*). Cats are infested with one species of biting louse (*Felicola subrostrata*), and rabbits harbor one species of sucking louse (*Hæmodipsus ventricosus*).

Life Cycle.—The life cycle of lice is spent entirely on the host. The female attaches its eggs to the hairs, each being glued fast by means of a cement secreted by the female. The eggs are deposited singly over a period of two or three weeks. These eggs hatch in from five to twelve days and the young louse develops into an adult.

Symptoms.—Both types of lice cause irritation to the skin. This results in scratching, rubbing or biting by the host, which may result in wounds or bruises of the skin. Animals become restless, may lose their appetite and a general loss of condition results, which may make them more susceptible to other diseases. *Trichodectes canis* may serve as the intermediate host of *Dipylidium caninum*.

Control.—Undernourishment of animals is a factor in the multiplication of lice, but these parasites may gain a foothold under the best conditions. Although lice will not breed away from their host, they may live for a period of about five days off the host. The eggs are not destroyed by the

majority of insecticides, hence a second treatment is necessary. This should be properly timed and in most cases should be done twelve to fourteen days after the first treatment.

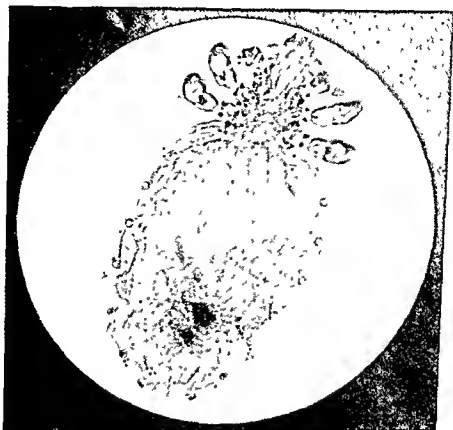


FIG 24.—*Linognathus piliferus* (sucking louse of dog).

Both the biting and sucking lice may be controlled by the use of derris powder or a 2 per cent creolin solution. If the creolin is used, the water should be soft and lukewarm. The face and eyes should be bathed in clear cool water following treatment.

MITES

The term mite is usually applied to minute free-living or parasitic arthropods. The many species, though differing in size and appearance, have certain common characteristics. The parasitic species infest plant and animal life, some causing direct injury and others transmitting disease.

The parasitic mites infesting small animals are *Sarcoptes scabiei*, variety *canis*; *Notadres minor*, variety *cati*; *Otodectes cynotis*; and, *Demodex canis*.

Sarcoptic Mange.—This is the so-called common mange or "itch" affecting the dog, and is caused by *Sarcoptes scabiei*, variety *canis*. This mite has very short legs, the posterior pair not extending beyond the margin of the nearly circular body; suckers are present on the first and second pairs of legs. The sarcoptic mites burrow in the skin, where they produce definite burrows in which the females deposit their ova. In from five to eight days, a six-legged larva emerges from the egg. This larva soon moults and presents its fourth pair of legs, and becomes adult in two or three weeks.

Sarcoptes manage may appear on any part of the body, but usually appears first in the region of the head. It gradually spreads and may be-

come generalized in four to eight weeks. Scratching and rubbing are the first noticeable symptoms. Small red spots appear, followed by papules and pustules, and these, becoming ruptured by scratching, lead to formation of moist areas which continue to spread. The areas first invaded soon become dry and yellowish-gray scabs are formed. The hair falls out during this process and the skin becomes thickened and wrinkled. There is an offensive characteristic odor and the animal is repulsive in appearance. Emaciation may develop and death result from cachexia and exhaustion.

Notoedric Mange.—This is the common mange of the cat and is caused by *Notædres minor*, variety *cati*. This mite is smaller and more circular than *Sarcoptes*, but otherwise quite similar.

Notoedric mange of cats begins at the tips of the ears and gradually spreads over the face and head. The acute stages are less marked than in the dog and may continue for months as a very mild condition with only slight thickening of the skin and scanty scab formation. There may be a slight loss of hair on top of the head and the skin may become thickened, hard and wrinkled. If the eyelids become involved, an intense conjunctivitis may result.

Rabbits and ferrets are also affected with Notoedric mange. In rabbits, it affects chiefly the skin of the head, particularly around the eyes, nose and at the base of the ears. It frequently extends to the hind and sometimes to the forepaws. Ferrets are usually affected about the head and feet, especially on the plantar surface and at the root of the claws. The lesions in the rabbit and ferret are similar to those of the cat.

Otodectic Mange.—This type of mange occurs in the ears of the dog, cat, fox, rabbit and ferret and is caused by the mite *Otodectes cynotis*. This parasite closely resembles the *Psoroptes* mite; they have suckers on the first and second pairs of legs in the female and on all four pairs in the male. The fourth pair of legs in the female is small. This parasite lives on the skin in the ear and deposits its eggs on the hairs of this region. The eggs hatch, in one to three days, into larvæ, which moult into nymphs after two to three days of feeding. The nymphal stage lasts three to four days and the mite becomes adult.

These parasites pierce the skin to suck lymph and thus produce an inflammation with exudation of serum and formation of crusts. The animal shakes its head and scratches the ears, and in advanced cases, the ears droop and a nasty discharge is observed. If the disease is allowed to take its course, a purulent inflammation of the external ear may develop which may result in perforation of the tympanic membrane.

Demodectic Mange.—This type of mange is caused by the mite, *Demodex canis*, which lives in the hair follicles and sebaceous glands. The parasites are elongate, and have a head, thorax and abdomen. The thorax bears four pairs of stumpy legs. The life cycle is not well known. The mites develop in the skin of the host, and are quite resistant, being able to survive for several days off the host. Infection is transmitted by direct contact or by mechanical means.

The mites enter the hair follicles and sebaceous glands, producing a chronic inflammation with proliferation and thickening of the epidermis and loss of hair. The early indications of demodectic mange is the presence of isolated inflammatory areas in which the hair appears as though closely

clipped. The condition gradually spreads and may involve the entire body. There are usually two forms of demodectic mange recognized, pustular and squamous. The pustular form is due to bacterial infection, which causes the formation of pustules in the affected areas. In the squamous type there is loss of hair, thickening and wrinkling of the skin, which becomes scaly.

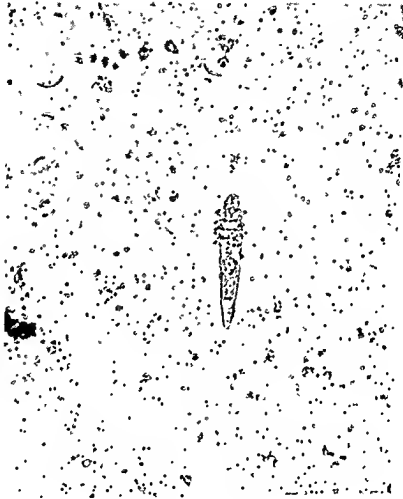


FIG. 25.—*Demodex canis*.

and all scales or crusts removed. This may be done by washing and scrubbing with warm water containing a mild soap. Care must be taken in washing cats as they do not endure bathing very well.

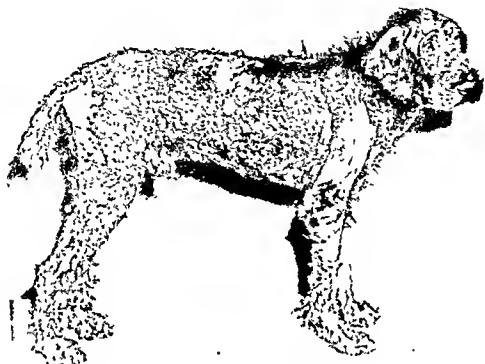


FIG. 26.—Sarcoptic mange.

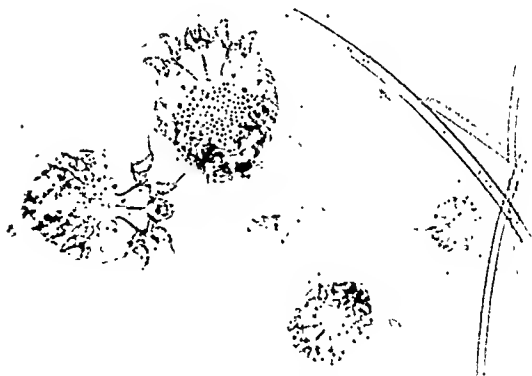


FIG. 27.—*Sarcoptes scabiei* (mange mite of dog).

Small animals, such as rabbits, can be treated with a mixture of 5 per cent sulfur in oil.

Otolalectic Mange.—The ears should be cleansed as well as possible and its external surface washed with a suitable disinfectant. For application to the inside of the ear, the following procedure has given excellent results:

Daily application for a period of three days of equal parts ether, alcohol (95 per cent), balsam Peru, and glycerin. This should be followed by the application of olive oil for two to three days. These preparations



FIG. 28.—Sarcoptic mange.



required a long series of treatments, discouraging to the client as well as the veterinarian. Recently, the use of fetal extracts and non-specific protein therapy has been suggested as a means of control, but more data must be obtained in this connection.

At the present time the preparation which is recognized as giving the best results is a solution of rotenone-acetone-alcohol in the following formula:

Rotenone	1 gm.
Acetone	10 cc.
Alcohol (95%) q.s.	100 cc.
Mix rotenone and acetone then add alcohol.	

This formula is marketed in varying mixtures, many being used in a special oil solution.

Treatment should not be commenced until the physical condition of the animal is known. If the animal be in poor physical condition, with a history of vomiting or dysentery, it is well to withhold treatment until the physical condition is corrected and then treat only a small portion of the body at a time. It is advisable to clip long-haired dogs prior to beginning the treatment.

The preparation is thoroughly massaged into and around the affected areas. Thorough massage appears to hasten improvement. Care should be taken to prevent any of the preparation reaching the conjunctival membrane or the cornea. The use of a brush is not advisable. If the animal refuses food, vomits, shows a watery stool or appears depressed, application should be discontinued until the patient is normal.

The preparation should be applied daily until recovery is complete, but each case must be handled individually, the veterinarian's judgment being the best guide.

Other preparations, such as balsam of Peru, are being used and when applied thoroughly have given fairly good results. Thorough application is an important factor in all cases.

In cases when pustules are present administration of an autogenous bacterial vaccine is recommended. Roentgen-rays are now being used with apparently good results in many cases.

TICKS

Dogs and cats, especially the former, are subject to attack by ticks. The food of ticks consists entirely of blood and lymph and all stages in the life cycle are blood suckers. The tick is a small parasite, having the thorax and abdomen fused. The head is lacking but the mouth parts are very well developed. Mature ticks bear four pairs of legs, while the larvae are six-legged. They vary considerably in size depending on the amount of engorgement with blood. The species of ticks most commonly affecting small animals are *Dermacentor variabilis* and *Rhipicephalus sanguineus*.

Dermacentor variabilis.—This tick is commonly called the "wood tick" or "American dog tick." It is widely distributed in North America, and may attack man, horses and other mammals. It is the principal vector of Rocky Mountain spotted fever in the central and eastern states. It also carries tularemia, bovine anaplasmosis, and may cause canine paralysis.

Life Cycle.—The engorged female drops from the host and deposits its eggs on the ground. The eggs hatch into larvae, usually after about thirty

days. The larvæ remain on the ground or on low vegetation awaiting its first host, which is usually a rodent. It feeds on this host from three to twelve days and then drops to the ground and moults into a nymph, after about one week. The nymphs again attack rodents and engorge for from three to ten days. They then again drop to the ground and moult into the adult tick in from three weeks to several months. In this adult stage they attack dogs and other large animals:

Rhipicephalus sanguineus.—This tick is commonly known as the "brown dog tick," although it may attack other animals. It is widely distributed, especially in warm climates. It transmits canine piroplasmosis, Rocky Mountain spotted fever, gall sickness of cattle, and may be an intermediate host of the *Dirofilaria immitis*.

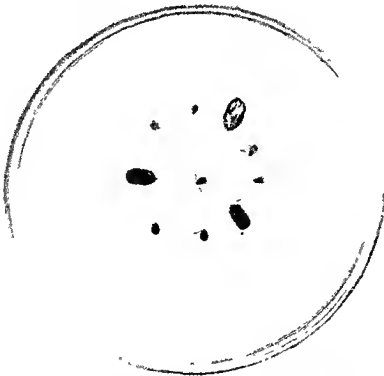


FIG. 30.—*Rhipicephalus sanguineus* (brown dog tick).

adding 4 ounces of derris powder having a rotenone content of 4 per cent. The wash should be applied at intervals of five days. The application of the powder is simpler, but a more thorough covering is obtained from the wash, which also has a longer repellent action.

The control of *Rhipicephalus sanguineus* is more complicated than that for *Dermacentor variabilis*, because the former tick lives in dwellings and other buildings. All cracks and crevices, in rooms which the dog has inhabited, should be dusted with derris powder. The procedure of dusting both the dog and the quarters inhabited by it, will in time eradicate this tick.

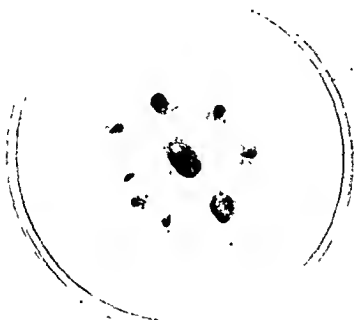


FIG. 31.—*Dermacentor variabilis* (common wood tick).

DERMATOMYCOSIS

Vegetable Parasitic Disease of the Skin

HERPES TONSURANS

Ringworm. Red Itch

Etiology.—This disease is produced by the *Trichophyton tonsurans* or other similar forms of fungi which are usually classed as the *trichophyta*.

Pathology.—The fungi develop around the shaft of the hair and extend down into the follicle but not to the root. The hair becomes brittle, splits and breaks off close to the skin. The enormous number of spores that grow in the follicles and beneath the epidermis set up inflammation, especially in the parts of the skin thickly covered with hair.

Symptoms.—Ringworm occurs in all small animals but is most common in the dog. The lesions may be found on any part of the skin but usually appear on the head and legs, parts frequently in contact with objects harboring the parasite.



FIG. 32.—Ringworm.

PART XI

DISEASES OF THE EAR

Examination.—The external ear (concha) in dogs varies greatly in size depending upon the breed and size of the animal. It is easily examined by direct inspection. Careful examination should be made for wounds, bruises, hematomas and scars. Long hairs in certain breeds will interfere to a certain degree with the examination. In cats and rabbits an inspection of the external ear can be made without difficulty. Note sensitiveness to manipulation.

The external ear canal can be inspected in ordinary daylight but the examination is facilitated by the use of an ear speculum and mirror to reflect the light to the bottom of the canal. An otoscope is very useful in making such an examination. The operator should exercise care in the examination by either muzzling or taping the animal. Examine the external canal for inflammation, tumors, foreign bodies, cerumen accumulations and parasites.

WOUNDS OF THE EAR

Various degrees of wounds are observed involving the concha. Bites from other animals are the most common causes. The lesion may be a simple scratch or cut in the skin or the entire structure may be split in various degrees. Extensive wounds are often found in all the animals. Constant shaking the head especially in long eared dogs often leads to extensive injury to the outer margin of the concha. This type of injury is often brought about by the parts being irritated by insects (flies) and parasites (*Otodectes cynotis*). In some animals the thick, heavy, cartilaginous conchal base may be fractured by external violence.

Symptoms.—In dogs careful shaking of the head and holding it to one side, crying and evincing pain when the ear comes in contact with objects are often noted. Careful inspection will reveal the nature and extent of the wound.

Prognosis.—Favorable in most cases. In dogs with long ears, and when the wounds are extensive, it is difficult to prevent their shaking the head and aggravating the wound, which will materially influence the healing process.

Treatment.—In recent wounds the edges should be carefully cleaned, straightened with the scissors if necessary, and approximated with sutures. To facilitate union in some cases it is necessary to bandage the ears over the top of the head using a cap to cover the entire head to hold them in place. Frequent dressing (twice daily) is advisable. Apply boric acid powder as an antiseptic and to prevent adhesions of the parts by the secretions. When extensive tearing of the entire structure is found, it is necessary in some cases to remove a portion of the ear-flap. In this case it is best to remove a similar portion of the normal ear so that the ears will be symmetrical after healing takes place.

ULCERATION OF THE CONCHA

This condition occurs most frequently in dogs and especially in the breeds possessing long pendent ears. The ulcerous process is found in nearly all cases on the edge of the concha.

Etiology.—Occurs in most cases from injuries with more or less constant shaking of the head. The irritation thus produced keeps up the injury and interferes with union of the parts. Ulceration is most frequent during the fly season. The irritation produced by the flies causes the animal to shake its head violently, injuring still further the wounded parts. This is observed especially in older animals. Other diseases such as otitis and eczema produce it in a similar manner. Hunting dogs are frequently affected from the ears becoming injured while going through brush, briars, etc.

Symptoms.—The condition is easily diagnosed as the ulceration is observed on or near the edge of the ear-flap. The constant shaking and holding the head to one side are the most pronounced symptoms. On examination the part is usually found edematous, hot, painful and more or less hemorrhage present. Dried blood will be found on the margins of the ear-flap. Should the fissuring be deep it may be infected.

Prognosis.—Should not be made very favorable as there is usually some loss in the ear-flap, which in some animals would be serious by disfiguring. Further, the condition is often resistant to treatment. The prognosis is less favorable in old animals.

Treatment.—The part should be first washed with an alkaline soap, to remove all dried crusts and other accumulations. Apply silver nitrate solution (2 per cent) to stimulate granulation. Follow by an antiseptic dusting powder (iodoform; xeroform). One of the essential factors is to protect the ears from further injury and irritation. This is best done by bandaging the ears over the top of the head and using a head cap. Frequent dressing with the above materials is advisable. If the condition is due to insect bites the animal should be protected. In hunting dogs the ears should also be protected from further injury by light head cap or bandage.

HEMATOMA

Hematomata are frequently found in dogs with long pendent ears. The condition is not uncommon in cats. Other animals are seldom affected.

Etiology.—This condition is brought about through traumatism. Very often it occurs secondary to otitis or ulceration of the concha. The hematoma results from a rupture of the capillaries and an extravasation of blood or serum between the skin and conchal cartilage.

Symptoms.—As a rule hematoma develops suddenly. The animal holds the head sideways, the affected ear down and frequently shakes its head. The ear-flap is sensitive to the touch, and a distinct bulging of the skin on the upper or lower surface is noted; both surfaces may be involved. The enlargement will be found sensitive, hot and fluctuating. When of longer standing, the acute symptoms will be absent and some organization of tissue will be found around the margins of the enlargement.

Diagnosis.—This is made on the location of the enlargement, the fluctuation and the absence of marked inflammatory symptoms.

Prognosis.—Favorable in most cases.

Treatment.—Several modes of remedial procedure have been used. The principles involved in the treatment in order to be successful consists in the evacuation of the contents, maintaining the separated tissues in contact so that union can take place, and keeping the ear-flap quiet. This is best accomplished perhaps by the following: shave the hair over the area and thoroughly disinfect the surface by painting with iodine. Make the incision at the most pendent portion of the enlargement and of sufficient length to permit all the serum, blood clots and organized tissue to be removed completely. Press out all the fluid and bring the separated tissues in contact with the cartilage. Retain in contact by suturing with interrupted sutures which pass through the concha. The sutures should be placed so that the skin is held in intimate contact with the cartilage at all points. A dressing of iodoform should be applied and the ears bandaged over the top of the head to insure a quiet position and sufficient external pressure to prevent any further collection of serum. The dressing should be changed daily. In a week or ten days the sutures may be removed and the bandage discontinued. This method must be rather rigidly adhered to if good results are expected. Other methods such as removing the collection of material and injecting Lugol's solution or tincture of iodine have been used.

OTITIS EXTERNA (OTORRHEA)

Involvement of the internal portion of the external ear with various degrees of inflammation is very common in dogs with long pendulous ears. In dogs, cats and rabbits from parasitic invasion. It is frequently unilateral, but in a number of cases both ears are involved. Middle aged or older animals are affected most commonly.

Etiology.—There are a variety of things having to do with the cause of this condition: (a) accumulations of cerumen and dirt and common causative factors. These substances cause irritation to the walls of the external canal resulting in inflammation and pyogenic infection. Animals with long pendent ears tend to retain these materials and decomposition and infection are thus formed. (b) Retention of debris from acute attacks lead to further irritation and often produces a chronic form of the disease with considerable thickening of the tissues. (c) In young animals the condition is frequently associated with distemper. Secondary infection during the progress of the disease involves the auditory canal. (d) Occasionally in dogs and cats but more commonly in rabbits, invasion with the parasite *Otodectes cynotis* occurs. In this case the entire canal is involved, even the internal ear. The parasites produce extensive irritation and an aggravated form of the disease. (e) May result from ulceration of the concha and hematoma by extension of the process from continued irritation. (f) Often involved in cases of eczema.

Symptoms.—In the early stages and when the condition is acute the animal shows restlessness, shakes and scratches its head and ears with its paws almost continuously, and rubs them against objects. Along the margins of the ear is often noticed a blood-mixed discharge. Direct examination reveals the ear to be hot, sensitive and the surface covered with a thick waxy secretion. Owing to the swelling of the skin and contiguous

tissues an ear speculum is often necessary in order to examine thoroughly the lower portion of the canal. During the later stages ulceration takes place and more or less extensive pus formation is found. Palpating the base of the concha and exerting some pressure, a thick, dark colored discharge will be forced out which may have a very offensive odor. The head is usually held in a fixed position, and if one side only is affected it will be held to that side. The condition may produce temporary or permanent deafness. In rabbits, when due to parasites, nervous symptoms are very common. This has been observed in dogs. Such parasites may be readily seen with an otoscope.

In the chronic form there will be extensive proliferation of connective tissue projecting out into the auditory canal. The mass is irregular in form, often pedunculated, and will in some cases close the entire opening.

Diagnosis.—The characteristic discharge and other symptoms as described make the diagnosis simple. Examination of the discharge should be made carefully to determine whether parasites are present or not.

Prognosis.—In the acute form, favorable. After extensive proliferation of tissue has taken place the prognosis is less favorable and recovery is difficult.

Treatment.—Both ears should be examined carefully to determine the degree of involvement. It is essential in the first place to remove all dirt and cerumen which has accumulated except when parasites are present. In this case the parasites should be destroyed before removal. An antiseptic powder (boric acid; xeriform; tannoform) is worked down carefully into the canal to produce antiseptic action and to prevent the secretions adhering to the skin surface. This treatment should be applied daily until the inflammation and swelling subside. In cases where extensive infection is present the appropriate sulfa drug is indicated.

In the chronic form with proliferation of tissue and ulceration the canal should be cleaned and the surface thoroughly cauterized with silver nitrate. To prevent undue cauterization follow by salt solution. After the ulcerative process is reduced antiseptic treatment can be substituted. Several weeks' treatment is often required in this form. Should the animal continue to shake the head and aggravate the condition a head cap may be employed for a few days. In long-eared dogs the ears should be examined every few weeks as there is danger of recurrence. Should parasites be present treat with antiparasitics such as 5 per cent phenol in glycerin, or balsam of Peru, alcohol, ether and glycerin equal parts. In cats it is inadvisable to use preparations containing phenol. The ears should not be cleaned until the parasites have been destroyed. Such a practice may prevent the infestation of other animals or quarters.

OTITIS MEDIA AND INTERNA

This condition is not very common in small animals. It occurs most frequently in rabbits from parasitic invasion. The diagnosis is difficult as the condition is usually complicated with involvement of the auditory nerve, or pachymeningitis. No treatment is of any value. Sedatives would be indicated to control the nervous symptoms.

TUMORS (NEOPLASMS OF THE EAR)

Neoplastic formations are not so common in this location. Papillomata occur commonly on the inner surface of the outer ear, but malignant tumors are rarely seen. Distentions of the sebaceous ducts are occasionally seen.

Papillomata.—These are found on the margins of the skin or in some portion of the vestibule of the ear and appear as single or multiple excrescences. They are flat, oval or cauliflower-like in their growth. The surface is smooth or roughened and frequently covered by a thick, greasy material.

Symptoms.—The presence of tumors often leads to irritation and may produce otitis. (See Otitis.) On examination they are observed either as isolated single tumors or multiple tumors and with smooth or irregular surfaces. They are often pedunculated and stand out prominently. When in the lower portion of the canal they may completely occlude the opening. The diagnosis can be made positive by microscopic examination.

Prognosis.—Favorable.

Treatment.—Operation is advisable. When large numbers are present the animal should be anesthetized and the entire surface cleaned and disinfected. The tumors are removed as close to the base as possible, best by the scissors. The base should be cauterized by the actual cautery. The after-treatment consists in keeping the part clean and using an antiseptic astringent powder (tannoform). If necessary a head bandage or cap may be used to keep the ear quiet.

Sebaceous Tumors or Cysts.—These are recognized by their rounded, well-defined appearance, absence of inflammatory symptoms, and the character of the contents.

Treatment.—The cyst should be opened well, all of the secretions pressed out, and tincture of iodine applied to destroy the gland. It may be necessary in some cases to open into the gland and destroy it by silver nitrate or the actual cautery.

DEAFNESS

Etiology.—This condition is observed from diseases affecting the internal ear, from closure of the external canal or it may be congenital. Paralysis of the auditory nerve may be the result of general infection (distemper) or ptomaine poisoning. Deafness is noted very commonly in puppies, sometimes several in a litter will be affected. This no doubt is due to improper development of the auditory nerve or other structures of the internal ear. The condition is acquired in some cases from disease processes and infection extending to the internal ear. Complete closure of the external canal will produce at least a temporary deafness.

Symptoms.—The most pronounced symptom is failure to obey commands. Puppies deaf from birth do not bark or make any definite sounds. In congenital deafness the examination will reveal nothing abnormal with the external ear. In acquired deafness in some cases the cause may be found, such as closure of the external canal.

Prognosis.—Unfavorable in all cases of congenital origin or in cases due to external infection or parasites entering and destroying the internal ear.

It is favorable in some cases of closure of the external canal with cerumen or tumor formation.

Treatment.—In congenital deafness no treatment seems to be of any value. If the deafness is due to paralysis of the auditory nerve small doses of strychnine would be recommended (0.001 once daily). Examination of the external meatus should be made and, if closed, it should be dilated and the cause removed.

EAR FISTULA

Etiology.—Dentigerous cysts are occasionally found in the temporal region and have their opening in the auditory canal. Wounds of the cartilage of the ear, either from sharp objects penetrating this region or from other causes may lead to a fistulous opening.

Symptoms.—The presence of a thick, white, glutinous discharge either into the auditory meatus or to the outside should be regarded with suspicion and the parts thoroughly examined. Often the hair will be removed; at the point of discharge it will collect, become dried and form crusts. Pressure over the region will often reveal the point of discharge. The introduction of a small flexible probe will make the diagnosis positive. There is in nearly all cases some enlargement in the tissues adjacent to the fistula.

Prognosis.—All fistulae involving the cartilage of the ear should not be considered in favorable light. As the process is a progressively destructive one, healing is difficult.

Treatment.—The part should be shaved and cleansed thoroughly. Introduce a flexible probe to determine the extent of the fistula and the tissue invaded. A free opening is made and all necrotic tissue removed. Pack the wound with iodine gauze. A head bandage should be employed to keep the pack in position. Dress the wound daily. After a few days it may be treated as an open wound. Some cases will require amputation of the concha. This, however, should be avoided if possible.

PART XII

DISEASES OF THE EYE

CHAPTER I

DISEASES OF THE EYELIDS

Examination.—This is easily accomplished in ordinary daylight, or artificial light. The following points are worthy of consideration: (a) note the position of the lids, whether they are normal or the degree of abnormality if present. (b) Note the reaction of the lids to ordinary stimuli. This is important to determine different degrees of sensitiveness. (c) Inspect the margin of the lids to determine whether or not the outline is regular, the presence or absence of the eyelashes. (d) Palpate the external surface for irregularities, tumors, etc. (e) The condition of the hair and surface of the eyelid should be inspected for wounds, denuded areas, eczema, mange, etc. (f) Evert the lids noting the resistance of the supporting structure and the condition of the conjunctival surface.

Various positions and reactions of the lids bear an important relation to different forms of paralysis and other diseases.

WOUNDS OF THE EYELIDS

Various degrees of wounds are found involving the eyelids. Lacerations of different degrees are quite common from injuries or having the lids caught on sharp objects and torn. These wounds may involve the margin of the lids, or the entire structure. Even slight wounds on the lids should be considered important on account of the deformity, entropion or ectropion which might result.

All wounds should be examined thoroughly in order to determine the actual condition present. The wound should be cleaned and washed with boric acid solution (2 per cent). Approximate with sutures and cover the surface with flexible collodion or airol paste. After adhesions have taken place the sutures may be removed and a dusting powder applied. Irritating substances should be avoided to prevent irritation to the eye proper.

When edema is present as a result of the injury, warm water applications are useful. If abscesses develop they are opened, drainage effected, and boric acid powder applied. All wounds should be given careful attention to prevent complications in the eye itself.

INFLAMMATION OF THE EYELIDS

Blepharitis

Definition.—An inflammation of the eyelids often leading to edema and supuration or abscess formation.

Etiology.—Several factors have to do with producing this condition: (a) wounds and bruises often develop into abscess formation. (b) Mange, (333)

particularly follicular, is a frequent cause in dogs; and sarcoptic mange in cats. (c) Eczema. (d) Exposure to cold winds, water, etc., seen in hunting dogs. (e) Spread of inflammation from the conjunctiva. (f) Foreign bodies penetrating the lids, such as briar barbs, etc.

Symptoms.—The condition is self-evident. An examination should be made to determine the cause of the inflammation, whether it is due to parasites, trauma, eczema, or other things.

Prognosis.—The prognosis is favorable in most cases unless complications involving the eye are present.

Treatment.—Treatment must be applied to remove the cause of the condition. When due to mange mites non-irritating antiparasitic agents are recommended. Balsam of Peru has been very satisfactory for this purpose. In eczema the surface of the lid should be freed of all scales and other accumulating material by washing, and astringent antiseptics applied either in the form of solution or dusting powder. Abscesses when present should be opened and proper drainage afforded. All foreign bodies present must be removed and the wound treated with boric acid solution (2 per cent).

MALPOSITION OF THE EYELIDS

Several malpositions of the eyelids are met with, especially in dogs. Certain breeds of dogs are predisposed thereto from their breeding. The abnormalities most often found are: (a) entropion, (b) ectropion, (c) ptosis, (d) paralysis of the orbicularis, and (e) spasm of the orbicularis.

Entropion.—**Definition.**—An inversion of the eyelids either in part or the entire lid. Entropion is usually complicated with trichiasis in which the eyelashes cause more or less direct irritation and injury to the conjunctiva and cornea. Enophthalmus predisposes to this condition.

Etiology.—It often results from the cicatrization of wounds, chronic inflammation of the lids, and mange. Certain breeds of dogs seem to be predisposed to this condition.

Symptoms.—The eyelid is turned inwardly against the cornea. The eyelashes coming in contact with the cornea, produce inflammation, supuration and in some cases ulceration and opacity. There is copious discharge of tears, and pus. The conjunctiva will be found reddened and congested.

Prognosis.—Favorable. The condition can be corrected in the majority of cases.

Treatment.—The injury to the cornea or conjunctiva may be treated with boric acid solution (2 per cent). Surgical treatment is necessary in order to afford permanent relief. An elliptical piece of skin is removed from the eyelid, parallel to the margin and about $\frac{1}{4}$ to $\frac{1}{2}$ inch from the edge of the lid.

Entropion forceps are used to grasp a sufficient fold of the skin so that when it is removed and sutured the edge of the lid will be drawn outward or everted. Care should be used to avoid injury to the deeper structures or the margin of the lid. A certain amount of judgment is necessary to determine the amount of skin to remove in each case. After operation the wound is covered with an impervious dressing (flexible collodion, airo paste). In two or three days the sutures may be removed. Recovery is prompt and complete in most cases. The injection of sterile mineral oil

(heavy) under the skin of the affected lid in an amount sufficient to bring about the normal position of the lid, often leads with good results. Eye complications should be treated according to their condition.

Ectropion.—**Definition.**—An eversion of the eyelid in part or the whole lid. It is rare in animals. Some breeds are more predisposed than others (bloodhounds, pointers, St. Bernards). The lower lid is most frequently involved due to the lesser curvatures as compared to the upper.

Etiology.—The common causes of this condition are: wounds with cicatrix formation, lacerations of the margin of the lid, ulceration and abscess formation of the lid, and inflammation of the conjunctiva. All of these conditions tend to force the margin of the lid outward. Paralysis of the facial nerve allows the lower lid to fall outward.

Symptoms.—The prominence of the conjunctiva of the lower lid and the formation of a more or less deep gutter from the separation of the palpebral edge from the cornea are present in all cases. The conjunctiva is reddened, thickened, and there is a more or less constant flow of tears down over the face.

Prognosis.—The majority of cases can be relieved by surgical means. It might be possible that the operation will need to be repeated to properly approximate the parts.

Treatment.—In mild cases, resulting from congestion of the conjunctiva, relief is afforded by removing the cause and treating with mild astringents and antiseptics (0.5 to 1 per cent zinc sulfate solution).

When the conjunctiva is chronically thickened forcing the palpebral edge outward, it is advisable to remove a portion of the conjunctiva. The resulting contracture of the wound in healing will bring the lid back in position. Codrenin solution should be instilled into the tissues before operating to reduce the pain and control the hemorrhage.

Several operations have been used successfully in relieving this condition. The removal of a V-shaped portion of the lower lid, leaving the margin of the lid free, and bringing the edges of the wound together with sutures has been successful. This forces the margin of the lid upward and inward. The amount of tissue removed will depend upon the degree of correction to be made.

Another method frequently employed is to remove a triangular piece of skin just outside of the external canthus and on a direct line with the lower lid, the base of the triangle being upward. Sutures are applied and the traction of the sutures and the cicatricial tissue formed keeps the lower lid pulled upward. In this case the size of the triangle will depend on the degree of ectropion present.

These operations should be made under strict antiseptic precautions and the parts protected. If necessary a head bandage with eye protector can be used.

Ptosis.—**Blepharoptosis.**—**Definition.**—A dropping or falling of the upper lid so that it continuously covers the eye. It may occur as a symptomatic condition in conjunction with other local affections, such as atrophy of the eyeball, enophthalmus, etc.

Etiology.—The causes are various:

(a) It may be sympathetic, resulting from paralysis of the cervical sympathetic nerves. Wounds and injuries to the nerve, or growths, or enlarged glands, in its cervical or intrathoracic course will produce ptosis.

(b) Ptosis is often paralytic produced by a paralysis of the muscles of the upper eyelid, either due to a lesion of the muscle or its nerve supply.

(c) It may result from fracture of the orbital rim or process of the frontal bone.

(d) Tumors pressing on the cerebrum or cerebellum have been known to cause it.

(e) Ptosis often follows distemper, and other general diseases.

(f) Very often tumor formation on the upper eyelid will gradually overcome the muscular action and drag the eyelid downward.

Symptoms.—The position of the upper eyelid, which hangs downward and partially covers the eyeball, is characteristic. All movements of the animal indicate its inability to move the eyelid to any degree. The most important thing to be considered is the causative factor, and the examination should be made to determine it, if possible.

Treatment.—The treatment should be applied to remove the cause. If sympathetic and the lesion apparent an attempt should be made to correct it. Very often the cause is central and cannot be removed. Potassium iodide in small doses is indicated. If of paralytic origin nerve stimulants, such as strychnine sulfate (0.001 daily) may be tried. Tumor formations on the eyelid should be removed conserving as much of the lid as possible.

Paralysis of the Orbicularis Nerve.—**Definition.**—Paralysis of the facial nerve, probably of central origin, may be peripheral in which the eye is held open, the lower lid relaxed falling away from the eyeball.

Etiology.—The cause of paralysis of the orbicularis may be wounds or contusions of the nerve leading to temporary or permanent paralysis. When of central origin it often results from hemorrhages in contact with the nerve at the point where it leaves the brain; or thrombus formation in the left posterior cerebellar artery interfering with the nutrition of the nucleus of the facial nerve. Tumors of the brain, and chronic lesions resulting from distemper have also been found to produce it.

Symptoms.—The lack of symmetry of the two sides of the face is the most apparent symptom of facial paralysis. The side paralyzed has a relaxed and drooped appearance. The eyelid will be drooped to a degree and cover a portion of the eyeball but cannot be closed producing a condition of lagophthalmus. There is a very noticeable absence of winking of the lids. Palpation of the lids will at once reveal their condition.

Prognosis.—If of peripheral origin and resulting from simple contusing a favorable termination may be looked for. However, if indications point to central origin the condition is often permanent. The degree of injury to the nerve will determine the prognosis. Unfortunately in many cases this cannot be accurately determined.

Treatment.—As the eye cannot be completely closed, the cornea is exposed and may become dry and injured. An attempt should be made to correct this if possible. Oily collyria should be instilled in the eye two or three times daily. Massage over the course of the nerve trunk with a stimulating liniment (white liniment, soap liniment) often produces good results. Internal administration of strychnine sulfate (0.001 to 0.0025 once daily) should be continued for a few days. If no results are obtained from the treatment after a course of two to three weeks further medication should be discontinued.

Spasm of the Orbicularis Nerve.—*Blepharospasm.*—**Definition.**—A tonic or clonic spasm of the eyelids. It may occur periodically or be continuous. In the tonic form the eye is more or less permanently closed and constitutes usually a reflex symptom of a local eye disease, such as keratitis, panophthalmitis, conjunctivitis, or the presence of foreign bodies in the eye. Naturally the vision is interfered with by the original affection as well as by the spasm of the orbicularis nerve.

Clonic blepharospasm is observed in dogs following distemper when chorea-like movements are a sequel. Rapid contractions and relaxations of the lid (winking) take place. Twitching of the muscles of the face and ear often are associated with the eye symptoms.

Treatment.—An examination of the eye should always be made to determine the cause of the condition. If the symptoms result from local affections, treatment must be applied to relieve the special condition. If no local involvement can be found, treatment is out of the question. Twitching of the eyelid as a sequel to distemper may disappear in a few weeks, or may remain permanently. Treatment has been unsatisfactory.

TRICHIASIS

Definition.—An abnormal position or direction of the eyelashes. The condition, as a rule, is not observed in animals unless the lashes are directed toward the cornea and more or less injury to this membrane occurs. Trichiasis is often congenital in dogs, although it may be acquired. The smaller breeds of dogs are most often affected (Pekinese and Japanese spaniels). It also occurs in the cat.

Symptoms.—The principal symptoms are lacerimation, keratitis, blepharospasm, and ulceration of the cornea. The eye must be examined by elevating the lids, and after cleansing with tepid water the lashes will be seen taking an abnormal direction. Extensive irritation and injury have been observed in such cases when they have been neglected.

Prognosis.—Favorable, except when the complications lead to corneal ulcer, or panophthalmitis.

Treatment.—Removal of the offending lashes is the first consideration. Their removal is effected by pulling them out with small tweezers or forceps. Temporary relief can also be obtained by cutting the lashes close to the margin of the lids. More permanent results will be obtained by performing the entropion operation. Any injury to the structures of the eye should be treated with antiseptics (boric acid 2 per cent solution in distilled water).

DISTRICHIASIS

Definition.—A condition in which there are two rows of eyelashes present on the margin of the lids. One row is usually normally directed while the other is misdirected against the eyeball. The smaller breeds of dogs are most often affected. The abnormal lashes grow out from the puncta or outlets of the Meibomian glands.

The symptoms and treatment are the same as in trichiasis.

ADHESIONS OF THE EYELIDS

A normal adhesion of the eyelids is found at birth, and continues for a period of twelve to fifteen days. At this period the eyelids open and assume

their normal function unless some abnormality is present. Adhesions form between the margins of the lids which may be partial or complete (ankyloblepharon), or between the eyelids and the eyeball, the margins of the lids being free (symblepharon).

Ankyloblepharon.—In complete ankyloblepharon the palpebral fissure has entirely disappeared. An incomplete closure of the palpebral fissure is known as blepharophimosis. This condition, as a rule, is congenital, and is found in the dog and cat. It is diagnosed readily. A sufficient time should be allowed (ten to eighteen days) for the normal adhesions to disappear. Very often there will be found a small line or groove at the point where the opening should be.

Treatment.—A small opening is made through the lid at the outer canthus, a grooved director inserted and the incision carried clear across to the inner canthus. The after-treatment consists in washing the eyes with a horic acid solution (2 per cent), and applying vaseline to the lid margins to prevent further adhesions.

In blepharophimosis there is a narrowing of the palpebral fissure which makes the eye appear much smaller than normal. It is often associated with trichiasis or entropion. To correct it the palpebral opening should be enlarged at the external canthus, and the skin sutured back both on the upper and lower lids to prevent adhesions. This operation will also correct trichiasis or entropion if either should be present. Keep the wound clean and apply a mild ointment to the recently incised margins.

Symblepharon.—This is an adhesion of the eyelids to the eyeball, and has been observed in dogs and cats. The majority of cases are congenital. Occasionally an acquired symblepharon is found due to adhesions following destruction of the conjunctival membrane during the course of distemper. An examination of the eye will at once reveal the condition. The lids cannot be everted and are found adherent to the eyeball.

Treatment.—Separation of the lid from the eyeball is possible. The animal should be anesthetized. The lids are carefully separated so that the eyeball is left intact. The operation can be done satisfactorily with a fine pair of scissors or a very small scalpel. After the operation is completed all hemorrhage must be controlled and an antiseptic ointment applied under the lids. Yellow oxide of mercury ointment has proved satisfactory for this purpose. It should be applied daily.

LAGOPHTHALMUS

Definition.—An incomplete closure of the eyelids in which a portion of the cornea is left exposed. When the cornea or conjunctiva is left continuously exposed to the air without the normal secretions covering them, they become irritated, inflamed and serious alterations take place. The membranes are thickened, the cornea opaque and dry, and may even become perforated. The tears follow the angle of the eyelids and flow down over the face. The condition is brought about in most cases by ectropion, exophthalmus, enlargement of the eyeball, and some few cases by paralysis of the orbicularis nerve. Wounds of the lids with extensive loss of substance may also produce it.

Treatment.—The first indication is to remove the cause, if possible. If this cannot be done the only thing left is to protect the conjunctiva and cornea from desiccation and eventual destruction. Oily solutions are best for this purpose. Instill them into the eye once or twice daily.

TUMORS OF THE EYELIDS

Several varieties of tumors are found on the eyelids of small animals.

Papillomata.—*Warts.*—These are not uncommon in dogs. In old dogs and cats, horn-like growths are found as outgrowths from the walls of Meibomian cysts. Small warts are also seen developing along the margin of the lid, or on the skin over the eyelid.

Treatment.—Small warts appearing on the margin of the lids, or skin, are removed with the seissors. Cauterize the base of them with silver nitrate, and follow at once with salt solution to prevent undue caustic action and injury to the eye. Conserve as much of the eyelid as possible. Warts projecting out from the Meibomian glands are opened and curetted with a small instrument. The base of the warts should be carefully cauterized.

Chalazion.—*Meibomian Cyst.*—These are small cystic growths, appearing on the free margin of the lid, or on the skin, standing out prominently. They are sebaceous cysts having no inflammatory reaction and filled, as a rule, with a thick honey-like material. A true chalazion is a retention of the secretions of the Meibomian glands. They are frequently observed in dogs, more commonly in mature animals. They form a firm, circumscribed swelling, gradually enlarging until they reach the size of a pea or walnut. A differentiation is difficult to make as they resemble sebaceous cysts. Their development often leads to a horny-like excrescence on the surface, and often take on the character of a malignant growth. They may involve the free margin of the lid, or extend to the entire structure of the upper eyelid.

Treatment.—The contents of the cysts are discharged. This is best done by crushing the small cyst with an artery forceps. Iodine is then applied to destroy the gland and cyst wall.

Granulomas.—Resulting from wounds, granulatous tissue is often found developing on the free margin of the lids, or on the surface. This is easily determined by its general appearance. If there should be doubt a definite diagnosis may be made with the microscope.

Treatment.—Complete extirpation is indicated. Cauterize the base of the tumefaction with silver nitrate, or actual cautery.

Malignant Neoplasms.—Several varieties of malignant tumors have been found involving the eyelids of small animals. Epitheliomata, sarcomata, carcinomata, and tuberculomata are the ones most often observed.

Diagnosis.—A diagnosis is made partly on the character of the growth and finally by microscopic examination.

Treatment.—Complete excision of the tumor should be attempted as early as possible. When the entire eyelid is involved treatment is of very little value. Recurrence of the tumors is liable to occur after operation. In removing the tumor as much as possible of the eyelid should be saved.

CHAPTER II

DISEASES OF THE CONJUNCTIVA

Examination.—Examination is simple in the dog and cat. The animal should be held either by an assistant or restrained so as to facilitate the examination. Ordinary daylight or artificial light may be used. The lower lid can be pulled downward by placing the thumb on or near the palpebral margin, and the upper lid pushed upward with the index finger of the same hand in a similar position. This manipulation will expose nearly all of the membrane. The examination is made for inflammations, foreign bodies, cysts, tumors, and wounds of various kinds. Vicious animals should be restrained by taping the mouth or by general anesthesia.

CONJUNCTIVITIS

Definition.—Inflammation of the conjunctiva. In small animals various types of inflammation are of frequent occurrence. These animals are subjected to injuries which often involve the conjunctival membrane, and infectious diseases (distemper in dog and cat) which produce various forms of inflammation. The xerosis bacillus, *Staphylococcus albus* and *Staphylococcus aureus*, streptococcus, diphtheria bacillus and others are more or less present in the eye leading in many cases to local infection and inflammation.

It is noted further that the conjunctival membrane is very vascular, rich in lymph cells, and sensitive to outside influences, all of which tend to favor the development of inflammatory conditions.

The following forms of conjunctivitis are recognized:

(a) Catarrhal, (b) purulent, (c) parenchymatous, (d) croupous, (e) follicular, and (f) exanthematous.

Catarrhal Conjunctivitis.—A form of inflammation of very frequent occurrence in all small animals. It is characterized by congestion, swelling, and a discharge which may be serous, mucous, or mucopurulent.

Etiology.—Catarrhal conjunctivitis is often associated with or secondary to other diseases, such as eczema, distemper, nasal catarrh, bronchitis and some constitutional diseases.

Mechanical conjunctivitis often occurs in small animals from injuries of various kinds, foreign bodies, dirt or dust getting into contact with the membranes. Cold winds sometimes produce it in hunting dogs.

Irritating collyria instilled too often may produce it. Serious disturbances are frequently observed from too strong solutions.

Infection no doubt plays an important rôle in producing catarrhal conjunctivitis. The ordinary infection is constantly present and develops when the local resistance is reduced.

Symptoms.—There is a distinct change in the color of the membrane and a mucous or mucopurulent discharge. The congestion of the membrane produces a pink or reddish coloration which may be accompanied by a slight yellow tinge due to interstitial infiltration.

The secretion, at first serous, soon changes to mucous or mucopurulent and collects around the palpebral margin. The edges of the lids are found edematous.

Some photophobia is present. The animal will show more or less constant movement of the lids, and holds the lids partially or completely closed. A careful examination reveals the true nature of the condition.

Prognosis.—As a rule favorable except when secondary to infectious diseases. The inflammation usually subsides in a week or ten days.

Treatment.—A careful examination should be made to determine whether any foreign substances are present which must be carefully removed.

Wash the membranes thoroughly with boric acid (2 per cent). This can be repeated two or three times daily during the first few days. Follow each application of boric acid with an instillation of one of the following solutions: zinc sulfate (1 to 1.5 per cent); tannic acid (1 to 2 per cent); chinosol (1 to 500); protargol (2 to 4 per cent); or if the condition is persistent solution of silver nitrate (0.5 per cent).

The animal should be isolated and the premises disinfected to avoid spreading the disease.

Purulent Conjunctivitis.—*Blennorrhea.*—*Acute Form.*—**Definition.**—A purulent secretion present in one or both eyes. In this condition the discharge is more copious and the inflammation more intense than in catarrhal conjunctivitis. Purulent conjunctivitis results very frequently from or accompanies distemper of dogs and cats. It often occurs as an epizootic or enzootic in kittens and puppies. Both the acute and chronic forms of the disease are frequently met with in practice.

Etiology.—The majority of cases can be determined quite definitely to be due to infection accompanying or following infectious diseases. It is very common in dog distemper and cat distemper. Various kinds of organisms have been isolated from the discharge but none of them has been proved to be the specific cause. The fact that large numbers of puppies and kittens are affected, when closely associated, indicates the communicable character of the disease. It is possible to have this form of conjunctivitis follow the catarrhal, owing to the reduced resistance of the membrane which allows secondary infection to develop. It is, however, possible that many cases are produced in some animals by parasites.

Newly born animals contract the disease from the vaginal infection of the mother at the time of parturition.

Symptoms.—The conjunctival membrane is of an intense red color and more or less uniform over its entire surface. The degree of redness depends upon the severity of the infection and the stage of development. In many cases the mucous membrane is prominent from the edematous swelling resulting from the irritation, thus giving it a "pouching out" appearance. The amount of pus present is more or less characteristic. The eye is often entirely filled with a thick, whitish, glutinous pus, which becomes dried around the palpebral borders and forms crusts frequently agglutinating the eyelids. On account of the spread of the infection to the cornea, this organ becomes cloudy or even ulcerated. Owing to the irritant action of the pus the animal will show considerable pain, scratch and rub the eyes either with the paws or against objects. The membrana nictitans is red and protrudes over a portion of the eyeball. Most cases show considerable photophobia.

General.—General symptoms are noted in many cases in the form of dullness, loss of appetite and general weakness.

Prognosis.—The prognosis is not always favorable. Due to complications, which may involve the eyeball, partial or total blindness can result. While many cases terminate in complete resolution, others produce ulcerations and perforations of the cornea. When the latter occurs panophthalmitis is the result. In some animals, this would seriously interfere with the obtaining of food. When parasites are the cause of the condition other complications follow, such as infestation of the nasal passages and sinuses.

Treatment.—Thorough disinfection of the premises, houses, etc., should be practised in order to prevent the spread of the infection. This can be accomplished either by the use of liquor cresolis compositus (3 per cent) with which all places and articles in contact with the animals are thoroughly saturated, or the animals are removed from the kennel which is then disinfected with formaldehyde fumes.

The general condition of the patient must be considered and its strength maintained by good, nourishing food and such tonics as tincture of gentian, or tincture of nux vomica (0.2 to 0.4 twice daily).

Local treatment is applied at least twice daily in order to remove the irritating material from the conjunctival sac, and also to destroy infection. Many preparations have been recommended and used for this purpose: boric acid (2 per cent); creolin (2 per cent); chinisol (1 to 500); protargol (2 to 3 per cent); zinc sulfate (1 to 2 per cent); or in severe cases silver nitrate (0.5 per cent). This treatment must be continued for one to two weeks to obtain the best results.

Chronic Form.—This form of the disease has been observed very frequently in dogs and cats following infectious and contagious diseases. To recognize it as being separate from the acute form is necessary on account of its persistent and long course. It is very common in old animals and those kept under bad hygienic conditions. Many cases of eczema and mange are associated with chronic purulent conjunctivitis. It may follow the acute form.

Etiology.—There are many factors producing parenchymatous conjunctivitis. Many of them are the same as those causing the catarrhal form. Injuries to the mucous membranes and underlying structures can produce it. Chronic agents in the form of irritants, such as irritating collyria, when used too often or in too large quantities; thermic agents in the form of hot water or hot antiseptic solutions. The disease is observed in hunting dogs from exposure, or to foreign bodies getting into the eyes while going through briars and brush. Infection plays an important rôle in the production of this form of conjunctivitis. The infection is often introduced directly into the conjunctival sac where it enters small wounds and produces intense inflammation of the parenchyma. Numerous organisms have been isolated in these cases. It is evident that no one specific organism produces it. The disease may also develop secondarily (hematogenously) to some of the infectious diseases. It is a common sequel to dog distemper.

Symptoms.—The early indications of the disease are swelling and puffiness of the mucous membrane. This is so marked in many cases that the swollen conjunctiva pouches outward over the palpebral borders or the cornea. During this stage the conjunctiva is intensely congested and reddened. There is considerable lacrimation and photophobia during the entire period of the disease. In the second stage there is a purulent discharge from the eye, which may be very copious. The general condition of the patient is usually not disturbed unless complications develop, or from the attending infectious diseases.

Prognosis.—The prognosis in most primary cases is favorable. In the acute form it subsides in a week or ten days. When secondary to infectious diseases, the prognosis is not so favorable. In such instances it may develop into a chronic purulent conjunctivitis.

Treatment.—Prompt treatment is important in preventing the spread of the inflammation. Antiseptic and astringent solutions should be employed: boric acid (2 per cent); lead water (2 per cent); potassium permanganate (0.25 per cent); tincture opium (1 per cent). If the patient shows considerable pain and irritation with marked congestion of the membrane, codrenin solution (2 per cent), or a few drops of stovaine solution (2 per cent) are recommended. When intense pain is present and the conjunctiva is a dull, red color indicating a subacute inflammation, silver nitrate (0.5 per cent) is of value.

Croupous Conjunctivitis.—**Definition.**—An inflammation of the conjunctiva characterized by the formation of a pseudomembrane which covers its surface. Croupous conjunctivitis is observed more commonly in the dog and cat.

Etiology.—The majority of cases occurring in the dog and cat are produced either by chemical irritation or as a result of specific infection following or accompanying infectious diseases.

Symptoms.—The conjunctiva is covered with a fibrinous exudate which frequently extends over the cornea. The corneal surface may be entirely covered. There are no general symptoms except as produced by some infectious diseases which the conjunctivitis attends.

Prognosis.—Favorable in primary cases. When secondary the prognosis depends upon the primary disease it accompanies.

Treatment.—The animal's general condition should be observed and any necessary treatment applied. The eye may be flushed out with a warm boric acid solution and the croupous membrane removed with a pledget of cotton or a pincette. After the membrane is removed, apply antiseptic or astringent collyria. It will probably be necessary to remove fragments of membrane as they later develop.

Follicular Conjunctivitis.—**Definition.**—An inflammation of the conjunctiva characterized by the formation of small, granular elevations over its surface. These granulations are due to swelling of the lymph follicles and to connective tissue proliferation, the result of inflammation. The granulations often attain the size of a grain of millet or larger. Follicular conjunctivitis occurs usually on the inner surface of the membrana nictitans. In a large number of dogs examined, nearly one-half were found to be affected with this disease. House dogs seem more susceptible than others.

Etiology.—The cause is unknown. Many etiological factors have been accused, such as dirt, dust and other irritants which enter the eye. Undoubtedly many cases result from distemper.

Symptoms.—As such a large number of dogs are affected with enlarged lymph follicles on the membrana nictitans one is led to conclude that their presence may not be abnormal. However, in many cases the granules appear also over the entire conjunctiva leading often to ectropion, an outward rolling of the eyelids. On examination the mucous membrane will be found to be of a dull red color and irregular on the surface. Small, white granules at their apices stand out quite prominently over the membrane. The membrana nictitans, when elevated with the forceps, will disclose small elevations on its under surfaces. In case of long standing the palpebral margins become red and the small glands prominent. There is some lacrimation and frequently a discharge of pus from the inner canthus. During the later stage small ulcers appear on the apices of the granulations, which, by confluence, form large, ulcerated surfaces. The eyes, kept partly closed and rubbed with the paws, show evidence of irritation and pain.

Prognosis.—The prognosis is not very favorable because the disease is usually well developed before the animal shows any marked symptoms. Owing to the chronic character of the disease the course is protracted, requiring long continued treatment.

table, held by an assistant, the membrana nictitans grasped with a small forceps and pulled outwardly toward the inner canthus of the eye. It is then cut off carefully with a curved scissors. Care must be taken to prevent removal of any of the other conjunctival membrane, as this would lead to scar formation and result in entropion. Serious hemorrhage may occur in individual cases. If the hemorrhage is copious a gauze pack should be placed over the eye and held in place by a head bandage. This may be removed in twenty-four hours and the ordinary antiseptic solutions used. Recovery from the operation requires ten days to two weeks.

Exanthematous Conjunctivitis.—**Definition.**—An exanthematous eruption occurring during the course of certain diseases. In small animals this form of conjunctivitis is not very common, but has been observed accompanying or following distemper in the dog and cat. Parasitic skin diseases and eczema often extend to the conjunctiva from the skin around the palpebral margins. This frequently results in suppurative inflammation of the glands along the margin of the lids, and in the membrana nictitans.

Treatment.—The treatment of exanthematous conjunctivitis is very similar to that of the catarrhal form and its varieties. The original disease must be treated, and antiseptic and astringent solutions applied to the affected conjunctiva. When there is severe lacrimation, calomel has proved to be of considerable value.

PTERYGIUM

Definition.—A triangular fold of the conjunctiva and subconjunctival tissue extending over a part of the cornea. It is derived from the bulbar conjunctiva and narrows to a point as it extends over the corneal membrane.

Symptoms.—Pterygium develops gradually and does not produce any marked irritation except a slight catarrhal inflammation. When it extends over on the cornea it may affect vision.

Diagnosis.—The diagnosis is not difficult. The triangular growth, attached more or less firmly to the cornea, rich in blood-vessels, which gives it a pink or reddish cast, characterizes it.

Prognosis.—Pterygium is not very serious and can usually be operated successfully.

Treatment.—It is advisable to treat the mucous membrane for a few days previous to the operation with antiseptic and astringent solutions. A local anesthetic should be administered, or if the animal is nervous, general anesthesia would be preferable. Dissect off the triangular fold of membrane from the cornea and remove it as near the base as possible with the scissors. It is further recommended that the base of the growth be dissected out completely and the wound sutured. The after-treatment consists in the use of antiseptic and astringent solutions. Recovery is usually prompt, and, if the operation has been thorough, the growth does not return.

TRAUMATIC LESIONS OF THE CONJUNCTIVA

Foreign Bodies in the Conjunctiva.—Various kinds of substances are found in the conjunctival sac of small animals. Dirt, straws, briars, seeds, splinters of wood, Spanish needles, etc., have been observed quite commonly. This is particularly true in hunting dogs, and animals that are

kept in dusty and unsanitary kennels. These substances are frequently found underneath the *membrana nictitans*.

Symptoms.—All foreign bodies cause more or less intense reactive symptoms, such as lachrimation, photophobia, serous or mucopurulent discharge, swelling of the eyelids, opaqueness of the cornea, etc. The severity of the symptoms will depend somewhat upon the character of the foreign body and the degree of irritation. The patient usually shows considerable pain, rubs the eyes against objects or with the paws, and thus intensifies the symptoms.

A sudden development of the symptoms cited especially in one eye should lead one to suspect a foreign body.

Treatment.—Flush out the conjunctival sac with warm water or boric acid solution (2 per cent). To avoid undue pain and to assist in making a more thorough examination of the entire conjunctiva it is advisable to instil into the conjunctival sac a 4 per cent solution of cocaine, or procaine. Raise the *membrana nictitans* and evert the lids so that a close inspection of the entire conjunctival sac can be made. In the majority of cases the foreign body is visible. A reading glass will facilitate finding small foreign bodies.

After the foreign body is located it is advisable to remove it either by flushing the surface with a boric acid solution (2 per cent) or by grasping it with a small forceps, or wiping it out with a pledget of cotton. Considerable care should be exercised to see that all of the foreign material is removed. After removal flush the mucous membrane two or three times daily with boric acid solution (2 per cent).

Wounds on the Conjunctiva.—Very often the conjunctiva is injured by sticks, pieces of straw, briars, etc. In the majority of cases the injury is slight and of little significance. In a few cases, where the lesion is extensive, there will be symptoms similar to those caused by foreign bodies in the conjunctival sac. A differentiation is made only by a careful examination.

Treatment.—The lids should be everted and the part thoroughly examined to determine the extent of the injury. If any shreds of membrane are present, they should be removed with the scissors. Antiseptic and astringent collyria are used until the symptoms subside.

CORROSIONS AND BURNS OF THE CONJUNCTIVA

These occur rather commonly in dogs and cats as the result of accident or intent. They may also be due to the use of strong collyria. A common practice, when dogs are fighting, is to separate them by throwing ammonia, pepper, or other irritant substances into their eyes. This often results in a serious inflammation of the conjunctiva and cornea. Thermic agents, such as hot water, also produce extensive injury.

Treatment.—A careful history of the case should be obtained if possible in order to determine the cause of the injury. It would be best to first flush out the eyes with a warm boric acid solution (2 per cent), and if the injury is produced by strong alkalis, follow with some soothing, lubricating agent, such as warm milk, or a dilute glycerin solution. Oleaginous preparations are also to be recommended. Ophthalmic ointments are useful. If the cauterization has produced an opacity of the cornea, of great value is a solution of *succus cineraria maritima compositus* (50 per cent) used daily.

ULCERATION OF THE CONJUNCTIVA

A more or less extensive ulceration of the conjunctival membrane occurs following diseases or injuries. It has been observed following burns and corrosions.

Treatment.—When ulceration of the conjunctiva occurs, the part should be thoroughly cleaned, curetted, and the base of the ulcer cauterized with silver nitrate followed by salt solution. This treatment may be repeated in a few days, if necessary. The conjunctival sac should be washed daily with boric acid (2 per cent) to prevent infection and injury to other parts of the eye.

TUMORS AND GROWTHS ON THE CONJUNCTIVA

In small animals, tumors involving the conjunctiva and the membrana nictitans are of frequent occurrence. Several varieties of tumors have been observed. The principal ones are: epitheliomata, sarcomata, tubercular nodules, dermoids, adenomata of the glands of Harder, papillomata, fibromata and lipomata. It is very essential that a differential diagnosis be made in order to distinguish the malignant from the non-malignant varieties. Malignant growths will not only invade the conjunctiva but spread rapidly to the adjacent tissue, and eventually cause the destruction of the entire eyeball.

Treatment.—All enlargements along the margin of the lids, on the conjunctiva or on the membrana nictitans should be removed completely as early as possible. This operation is best accomplished under general anesthesia. The after-treatment would consist in cauterizing the wound and the application of the ordinary antiseptics.

DERMOIDS

Dermoids are occasionally seen upon the surface of the eyeball. As the name indicates such an enlargement appears as a patch of skin upon the surface of which is a tuft of hair of varying size. The location is upon the conjunctiva covering the sclera in the vicinity of the external canthus, however, if large it may extend a short distance over the cornea. This is a congenital condition and is the result of incomplete development during the early life of the fetus. It is usually unilateral, but may be bilateral.

Symptoms.—Dermoids are frequently overlooked in puppies in fact, they are sometimes not found until the affected animal is mature. Eventually conjunctivitis develops which is often severe and purulent in character. This purulent material collects upon the eyelids as well as upon the hairs found upon the dermoid. On the latter it tends to cause the hairs to adhere to each other. Photophobia and lacrimation are to be expected. Opacity of the cornea is often present with disturbance of vision. The irritation produced may cause the animal to rub against objects or paw at the eyes with the feet.

Diagnosis.—The presence of an enlargement on the surface of the eyeball bearing a tuft of hair is sufficient to enable one to make a positive diagnosis.

Prognosis.—Fairly favorable unless severe complications have developed such as corneal opacities or ulcers.

Treatment.—If a purulent conjunctivitis is present it should be relieved by the use of neo-silvol 15 per cent, argyrol 10 per cent, zinc sulfate 2 per

cent, staphylo-jel, an autogenic vaccine or any other effective method. Complications are less likely to occur following an operation if the above precaution is taken. Preparation of the animal for the surgical procedure which is necessary should consist of the administration of a general anesthetic, and the application of a local anesthetic and hemostatic to the affected eye or eyes. Following retraction of the eyelids the dermoid is grasped with a suitable instrument and carefully dissected from the underlying structures. A small, pointed sharp scalpel is necessary for this purpose. If the dermoid is closely attached very careful dissection is necessary in order to avoid serious injury to the eyeball.



FIG. 33.—Dermoid of right eye.

After-treatment should consist in keeping the eye cleansed and the application of an ophthalmic ointment to make the animal more comfortable. Should an opacity develop treatment should be applied accordingly. Only a slight scar should remain following the surgical removal of a dermoid and this is only noticeable on close examination.

ENLARGEMENT OF THE LYMPHOID TISSUE OF THE MEMBRANA NICITANS

The membrana nictitans or third eyelid serves as an important accessory organ of the eye. In most breeds of dogs it is not very noticeable when normal, but in a few breeds having loose eyelids it may be readily seen. It is well supplied with lymphoid tissue. In the dog this lymphoid tissue is

well developed. It is frequently involved in an acute inflammatory process which usually accompanies or follows some form of conjunctivitis. While this condition may occur in any breed of dog it seems that those having prominent eyes such as the Boston Terrier and Pekingese are the most susceptible. The age of the animal does not seem to have any bearing on its occurrence.

Symptoms.—The condition may be unilateral or bilateral. When enlarged sufficiently to be noticeable the gland will extend beyond the margin of the membrana nictitans and appear as a slightly ovoid, bright red enlargement at the median canthus of the eye. In some cases it will disappear beneath the membrana nictitans, but eventually will recur. Occasionally the circulation becomes disturbed causing it to be dark in color with perhaps a dryness of the exposed surface. Lacrimation may be pronounced. Sight is not disturbed and even when greatly enlarged and bilateral, seems to cause the animal very little discomfort.

Diagnosis.—There should be little difficulty in making a correct diagnosis of this condition as the symptoms are so very characteristic. A severe inflammation of the membrana nictitans might be confused with this condition, but examination will determine whether or not the lymphoid tissue is primarily involved.

When apparently unilateral it is always well to examine the opposite eye since the gland in it may be equally large, but not displaced from its normal location.

For obvious reasons in case only one enlargement is removed surgically, an accurate record should be kept of the eye involved. The attention of the owner should be directed to the matter of which eye is involved before treatment is begun.

Prognosis.—Favorable in most cases. However, hemorrhage in some individuals may be so severe as to cause death if proper attention is not given. Such hemorrhage may be delayed, especially if the usual hemostatic has been used preceding the operation.

Treatment.—While an occasional case may respond to medicinal treatment it is not advisable since recurrence usually follows. The surgical removal of the lymphoid tissue is advisable. Since good restraint is essential a general anesthetic, as well as a local applied to the affected eye, is usually used. With the animal in a lateral position, properly restrained and the opposite eye protected from contact with the table by the hand of an assistant, the enlarged tissue is grasped with small vulsellum forceps and gentle traction applied. Such traction will have sufficiently isolated the tissue so that it may be severed at its point of attachment by means of blunt pointed, curved scissors; because of the possibility of a delayed hemorrhage animals should be observed rather closely for several hours following the operation. Should this occur the application of a moist pad under bandage gives the most favorable results.

After-cure may consist of the application of a non-irritating ophthalmic ointment or lotion.

INFLAMMATION OF THE MEMBRANA NICTITANS

Examination.—An examination of the membrana nictitans is very easily accomplished in small animals by ordinary daylight. Proper restraint of

the animal is necessary for a careful and thorough inspection. If the animal is of a nervous temperament, or inclined to be vicious, a general anesthetic should be administered, or the patient hopped and a tape applied around the mouth. The lids are then everted or held open with the thumb and finger while with the other hand the membrana nictitans can be grasped with forceps and elevated so that all parts of it can be examined. Examination should be made for inflammation, granular enlargements, tumors, and injuries.



FIG. 34.—Enlargement of the lymphoid tissue of the membrana nictitans.

As the mucous membrane of the membrana nictitans is exposed to the same causes of disease as the rest of the conjunctiva, it frequently shows lesions.

Symptoms.—Inflammation of the membrana nictitans is characterized by a red, more or less flat enlargement appearing at the inner palpebral fissure. In severe cases the membrane stands out prominently and extends over a portion of the cornea. A protrusion of the membrana nictitans is observed in tetanus, which should not be mistaken for an inflammatory condition. This can easily be distinguished by other symptoms of tetanus appearing in other parts of the body.

Prognosis.—Favorable in most cases. It may terminate in a chronic inflammation in which case the membrana nictitans will remain permanently thickened.

Treatment.—The entire membrane should be inspected closely for foreign bodies. Flush out the membrane daily with boric acid solution (2 per cent

If in the course of two or three weeks the swelling has not subsided, it would indicate a chronic inflammation. In this case the removal of the entire membrane is recommended.

WOUNDS OF THE MEMBRANA NICTITANS

In small animals wounds of the membrana nictitans are produced by the same causes as those producing traumatic conjunctivitis elsewhere. As a rule they are of little importance unless very extensive or followed by marked granulation. Antiseptic and astringent solutions usually suffice to heal them. If extensive granulation occurs, it may be necessary to extirpate the entire membrane.

TUMORS OF THE MEMBRANA NICTITANS

Various tumors have been found on the membrana nictitans. It is advisable in all cases to remove the membrane surgically.

CHAPTER III

DISEASES OF THE LACRIMAL APPARATUS

Examination.—This apparatus consists of the lacrimal gland and the lacrimal passages. In small animals it is somewhat difficult to make an examination of the entire apparatus. The lacrimal gland in the dog is flat, light pink in color, of a mixed type and is situated in the periorbit directly under the orbital ligament. In the cat the position is very similar.

The lacrimal openings (puncta lacrimalia) are elliptical fissures and are two in number in the dog. The lacrimal canal extends from the lacrimal gland to an opening in the lower border of the nasal canal. This is a whitish, membranous tube to conduct the excessive secretion into the nasal passages. The entire lacrimal apparatus is of lesser importance in small animals than in horses.

LACRIMATION

Epiphora

Definition.—A term applied to designate a flow of tears over the lid margins. It is not of common occurrence in small animals, except in certain breeds of dogs.

Etiology.—(a) Very often due to ectropion or entropion, which may produce a deviation of the puncta lacrimalia, allowing the secretion to flow out over the margin of the lids. (b) Obstruction of the lacrimal duct by foreign substances, mucus, etc. (c) Constriction and obliteration of the duct due to injuries, etc. (d) Lacrimation is often seen as a result of irritation or diseases affecting the conjunctival membranes. In this case the secretion forms so rapidly that the lacrimal duct cannot carry it away, the excess flowing over the lid margins. (e) Ordinary lacrimation may be produced by exposure to irritating gases, smoke, dust or cold air.

Symptoms.—A copious tear flow over the lid margin. An examination of the surroundings of the patient should be made, and also a close inspection of the conjunctiva and lacrimal apparatus, to determine if possible the cause of the condition. In certain breeds of dogs (spaniels, poodles, Boston terriers) it should not be looked upon as anything serious.

Prognosis.—As soon as the causes are removed most cases recover promptly. In case the lacrimal passages are obstructed, the prognosis would be unfavorable.

Treatment.—If possible remove the cause of the condition. If in the lacrimal passages, they should be opened by injecting a warm solution of boric acid (2 per cent) or sodium bicarbonate (1 per cent) with a fine nozzleed syringe. As the duct is often very small the operation is not always successful.

DACRYOCYSTITIS

Definition.—An inflammation of the lacrimal sac. It is quite common in dogs and cats.

Symptoms.—The first symptom is a swelling or bulging in the neighborhood of the inner canthus of the eye. When pressed with the finger the

contents are forced out through the *puncta lacrimalia*. The discharge may be serous, mucoid, or purulent, depending upon the age of the condition. The case often develops suddenly, the skin over the swelling becoming shiny and red. It often perforates and through the opening blood-tinged pus is discharged. Later the discharge becomes mucoid or serous. A lacrimal fistula frequently results from the continuous tear flow through the abscess opening. Dacryocystitis usually becomes chronic.

Prognosis.—On account of its chronicity and the development of fistula the prognosis is not very favorable. As a rule several weeks are required to bring about complete recovery.

Treatment.—In dacryocystitis, lacrimal catarrh and fistula thorough irrigation with warm antiseptic solutions is indicated. Apply with a syringe with a fine long nozzle. If the fistula persists, open the canaliculus and lacrimal sac by slitting and treat as an open wound.

CHAPTER IV

DISEASES OF THE CORNEA

Examination.—The cornea is normally transparent forming the anterior covering of the eyeball. It is shaped somewhat like a watch-crystal and in the dog and cat spherical in form. The surface is smooth and shiny. In examining the cornea employ either daylight or artificial light. The animal may be restrained with an anæsthetic or hopped and tape applied around the mouth. By everting the eyelids with the thumb and index finger the entire cornea is exposed. Its form should be noted, its curvature and its transparency. The curvature of the cornea of one eye should be compared with that of the other. Of assistance in this regard is a lighted candle. By noting the size of the flame as reflected by the cornea of each eye, comparisons may be made. If the curvature is weak, the flame appears larger; if strong, smaller. In dogs and cats physiological variations will be noted in the curvature of each cornea due to the difference in the shape and size of the eyes. The surface of the cornea should be smooth and even. To determine these observe it from the side, best using reflected light. The cornea should be tested for sensitiveness by gently touching it. It is normally very sensitive. In ulceration and when inflamed sensitiveness is increased; it is reduced in glaucoma. Further examination is made for cuts, scratches, foreign bodies, etc.

KERATITIS

Definition.—An inflammation of the cornea. Two types are recognized: 1, non-suppurative, and 2, suppurative keratitis. Under the former are included the following forms: (a) superficial, (b) vascular (pannus), (c) keratitis pigmentosa, (d) keratitis punctata superficialis, (e) parenchymatous, (f) keratitis punctata profunda. Under the latter are included: (a) ulceration of the cornea, (b) abscess of the cornea, (c) keratitis neuro-paralytica, and (d) keratitis from lagophthalmus.

Non-suppurative Keratitis

Superficial Keratitis.—**Definition.**—An inflammation of the cornea which involves the epithelial layer and the superficial layers of the parenchyma. It is very commonly due to accidents, injuries, and infections.

Etiology.—Superficial keratitis may result from (a) a spread of infection from the palpebral or scleral conjunctiva. (b) Wounds on the cornea. (c) Foreign bodies. (d) Chemical irritants, such as too strong silver preparations, antiseptics, etc. The common practice among the laity of using alum, ammonia and powdered glass in turbidity of the cornea obviously often injures it. (e) Spreading of inflammation from adjacent structures, such as the iris and ciliary bodies. (f) Superficial keratitis is often observed to accompany dog distemper.

Symptoms.—Lacrimation and photophobia are early and prominent symptoms. Clouding of the cornea in the form of a bluish-white film is seen which may be localized or general. An epithelial desquamation is often produced on the surface of the corneal infiltration. This is so slight

in many cases that it is not recognized. The symptoms usually disappear completely in a week or ten days.

Course.—The course is usually about two weeks.

Prognosis.—Favorable unless complications develop.

Treatment.—A careful examination should be made of all parts of the eyelids and cornea to determine the conditions accurately. Flush the cornea and conjunctiva with boric acid solution (2 per cent), or chinosol (1 to 2000 in distilled water). If considerable pain and photophobia are present a cocaine and atropine solution (1 to 150) is recommended. A solution of *succus cineraria maritima compositus* (50 per cent) has given most excellent results. Should the condition indicate chronicity, and no ulceration be present, a mild solution of silver nitrate will be found useful to change the type of inflammation and to act as an antiseptic and astringent. Daily examination and treatment must be carried out until the opacity disappears.

Vascular Keratitis.—*Pannus.*—**Definition.**—The formation of new vascular tissue extending over the cornea just underneath the epithelial covering. Pannus is not frequent in small animals; it is seen occasionally in dogs.

Etiology.—Pannus occurs in most instances from irritation of a severe form extending over a long period of time. In dogs it commonly results from chemical irritation, when strong chemical agents, such as alum, mercury, etc., are used in treating opacities and chronic conjunctivitis. It may be due to trichiasis or distichiasis, and is also a sequel to chronic conjunctivitis, or may occur during the course of dog distemper.

Symptoms.—Pannus usually begins with photophobia and lacrimation. This is soon followed by a gray or white opacity, traversed by numerous blood-vessels which can be easily seen extending over the cornea in the form of reddish, radiating lines. Later, when the cause is removed, the new tissue becomes organized and appears as a white opacity of varying density.

Prognosis.—Complete recovery is difficult to attain in all cases. The prognosis should be guarded as complications may follow.

Treatment.—A careful history of the case should be obtained in order to determine the cause, which should be removed, if possible. If opacity is present a solution of *succus cineraria maritima compositus* (50 per cent) is recommended, using a few drops once or twice daily. Some of the various nphthalmic nintments might also be tried or zinc sulfate 2 per cent, or quinine bisulfate ointment. Sterile milk when injected subcutaneously at daily intervals, in doses of 3 to 5 cc. has given good results in some cases. Operative procedure is recommended in case the ordinary treatment fails. The pannus may be removed by first giving the patient a general or local anesthetic, dilating the lids with an eye speculum, and carefully curetting the surface with a rather dull curette. Care must be taken to prevent curetting too deep. After operating apply antiseptics, and in severe cases cover the eye with sterile gauze held in place by a head bandage. Daily dressing is recommended.

Keratitis Pigmentosa.—*Pigmentary Keratitis.*—**Definition.**—A chronic disease of the cornea, either inflammatory or degenerative, with which is associated pigment deposit. It has been observed quite often in certain breeds of dogs and cats. The poodle, small house spaniel, and other house dogs are the most common sufferers.

Etiology.—In most cases pigmentary keratitis is secondary to ulceration of the cornea, other forms of keratitis and corneal opacities. It may occur as a primary condition in dogs having marked pigment deposits along the corneal limbus. In these cases it affects usually only a portion of the cornea, but may extend gradually to other portions. Occasionally the pigmentation may be deposited around the scleral corneal zone, extending toward the center of the cornea. The causes of the primary form are unknown.

Symptoms.—Pigmentary keratitis is characterized by deposits of melanin or pigment in the cornea. It usually begins as a fine, triangular network of small, dark lines radiating from the limbus, the base of the formation being at the limbus and the apex directed toward the center of the cornea. The triangular pigment formation is often so dense that the part of the cornea traversed by it is almost black. Sometimes the pigmentation disappears to reappear later. Continued recurrences eventually leave the cornea dull and uneven on its surface. Lacrimation and photophobia are little marked.

Prognosis.—The prognosis is unfavorable. As a rule following frequent recurrences permanent opacity of the cornea results.

Treatment.—Boric acid (2 per cent), or ichthyol (2 per cent) is recommended. Pain may be arrested by stovaine (2 per cent), or alypin (2 per cent), combined with the antiseptics. Internally potassium iodide (0.012 to 0.12) once daily, or atoxyl in small doses has been used with apparent success. The patient should be fed liberally and given good care.

Keratitis Punctata Superficialis.—*Facetted Keratitis.*—**Definition.**—A chronic inflammation of the superficial layer of the cornea causing opacity and the appearance of small facets occurring singly or multiple. This disease has been observed quite often in certain breeds of dogs but is very rare in cats.

Etiology.—Nothing definite is known in regard to its etiology. Dogs with prominent eyes are often affected. It has been observed to accompany or follow rheumatic affections. It may be due to injuries, infections, specific or general, or exposure.

Symptoms.—Cloudiness of the cornea is the earliest symptom. This is followed soon by small, opaque, white, gray or yellow spots which penetrate into the parenchyma of the cornea. Ulceration of one or more turbid areas may take place causing small facets to appear. Injection of the conjunctiva and scleral membranes is a prominent symptom which may gradually disappear as the case becomes chronic. Lacrimation and photophobia are frequently seen. Owing to the disturbance of the cornea it will have a shagreened appearance.

Prognosis and Course.—The course of the disease is chronic. The symptoms may almost completely disappear only to recur. Some cases show a tendency to become periodic. The prognosis, therefore, should not be made too favorable.

Treatment.—Flush the cornea with boric acid (2 per cent), chinisol (1 to 500), or silver nitrate solution (0.25 per cent). This should be followed immediately with a few drops of a solution of succus cineraria maritima compositus (50 per cent). This treatment should be continued for several days or weeks to obtain the best results. Some of the ophthalmic ointments may be tried in obstinate cases.

Parenchymatous Keratitis.—**Definition.**—An inflammation of the parenchyma of the cornea, characterized by a diffuse infiltration of the interstitial tissue with a vascularization of the sclera. It is accompanied in most cases by iridocyclitis. Parenchymatous keratitis is a very common affection in dogs but rare in cats.

Etiology.—Infection is an important factor. In dogs it follows or accompanies distemper. It may be due to a spread of inflammation from the iris (iritis), choroid (choroiditis), etc. Chronic eczema, mange, etc., when they affect the eyelids, ear, or adjacent parts, may be attended by it. Direct injury to the cornea may be a cause.

Symptoms.—The cornea becomes turbid, gray or yellow. The normal transparency is lost. The turbidity may not extend over the entire cornea. Very often a dulness of the cornea is all that is noticed during the early stages of the disease.

When the cornea is closely examined there will be found small elevations over the epithelial layer, and a network of fine blood-vessels radiating more or less evenly from the periphery to the center. The blood-vessels are often so small that a reading glass is necessary in order to see them. They run parallel to each other and usually do not anastomose but terminate in a small loop forming a zone entirely around the corneal limbus. These new formed vessels become quite extensive and involve the entire cornea. Lacrimation, photophobia, pain, and congestion of the sclera are present. When examined with an ophthalmoscope there will be evidence of iritis and choroiditis.

Course.—The course is usually several days to a few weeks. Abscess or ulceration of the cornea is a rare sequel.

Prognosis.—Owing to the changes that have taken place in the cornea, it requires quite a long time to bring about healing. The tendency to recur makes the prognosis rather unfavorable. Permanent turbidity of the cornea may result with partial or complete loss of sight.

Treatment.—During the early stages of the disease the patient should be protected from strong light and everything possible done to prevent irritation of the cornea.

Constriction of the vessels and reduction of the irritation are best brought about by applying to the cornea three or four times daily codrenin solution (4 per cent). This is continued for two or three days. When there is evidence of iritis or choroiditis atropine solution (0.5 per cent) is of value to prevent adhesions (posterior synechia).

If pus is present a mild, non-irritating antiseptic should be used. Recommended are boric acid (2 per cent), biniodide of mercury (1 to 10,000). Codrenin solution may be added to the above to constrict the blood-vessels and control the pain. When the condition becomes chronic silver preparations are useful. An autogenic vaccine has been used with good results and may be given every four or five days.

Give the patient plenty of good, nourishing food, occasional laxatives, and small daily doses of potassium iodide (0.016 to 0.032).

Keratitis Punctata Profunda.—**Definition.**—An inflammation of the deeper layer of the cornea appearing in the form of multiple, small spots. It is more common in the horse and dog than in other animals.

Etiology.—The cause has not been determined. It may be produced by specific infection and inflammation spreading from adjacent parts.

Symptoms.—Numerous small opacities or spots are noted in the depths of the cornea. They are visible to the naked eye, or are seen better with a reading glass, with oblique or direct illumination. The spots are mostly circular, well defined, evenly distributed, or more or less grouped. In color they are usually white, occasionally darker. The rest of the eye appears normal.

Prognosis.—Unfavorable.

Treatment.—No treatment is of avail.

Suppurative Keratitis

Ulceration of the Cornea.—**Definition.**—A destruction of the substance of the cornea, the result of infection with pus. The ulcers vary in size, some are not larger than a pin-point; others involve a large part of the cornea.

Etiology.—The causes of ulceration are varied. Wounds of the cornea, even though slight, form ports of entry for infection. In small animals the cornea is frequently injured by foreign bodies which enter the lid sac, by being bitten or scratched by other animals, or from an inversion of the eyelashes.

The undue exposure of the cornea which accompanies lagophthalmus, exophthalmus, and paralysis of the fifth nerve is a predisposing cause. Ulceration of the cornea accompanying or following infectious diseases, especially distemper of the dog and cat, is not infrequent. Purulent infection of the conjunctiva (palpebral, scleral, corneal) may lead to ulceration. The microorganisms most frequently found are streptococci, staphylococci, pneumococci, and other pyogenic germs.

The infection producing ulceration is no doubt in many cases carried by the blood to the cornea, and by the lymph into the cornea. Many diseases which reduce corneal resistance predispose to ulceration, such as chronic constitutional diseases, and some infectious diseases. This form commonly leads to perforation of the cornea.

Treatment.—Flush the corneal surface with a mild antiseptic solution (boric acid, 2 per cent; ichthyol, 2 per cent). If pain is present, drop into the eye a small amount of cocaine, stovaine or alypin solution, to reduce the irritation and prevent further injury by the patient rubbing or scratching the affected eye. This treatment will control the general infection preventing further spread of the ulcer. Where pus formation is copious (blepharorrhea) an autogenic vaccine may be prepared and used in conjunction with the other treatment.

Direct treatment of the ulcer requires judgment and care. Careful curetting followed by applying protargol solution (5 per cent) is recommended. Good results have followed the use of *succus cineraria maritima compositus* (50 per cent).

When the ulcer shows a tendency to perforate an antiseptic pack should be applied to the eye (eyelids closed), and a head bandage to hold it in place. This will exert outside pressure and may prevent perforation, permitting in the meantime new formed granulation tissue to strengthen the defect. Lead and silver solutions should not be used too strong on account of the danger of permanent deposits resulting. Treatment should be applied daily.

Abscess of the Cornea.—**Definition.**—A collection of pus in the cornea. Corneal abscesses are very common in dogs.

Etiology.—Infection with pus organisms usually through wounds or abrasions. Foreign bodies, bites and scratches pave the way for an infection which results in abscess. Corneal abscesses commonly result from distemper of the dog and cat.

Symptoms.—The first symptoms noted are discharge of pus from the affected eye, photophobia, and a tendency to rub the eye with the paws. On examination a yellow, sharply-defined abscess from the size of a pin-point to a wheat grain or larger is noted near the center of the cornea. The cornea surrounding the abscess may be transparent but is often turbid. As the abscess ages new formed blood-vessels are projected from the corneal blood-vessels across the cornea to the abscess. Surrounding the abscess a blood-vessel appears. If the abscess is large, or a number of small abscesses are present, the curvature of the cornea becomes stronger, sometimes cone-shaped. Conjunctivitis, congestion of the episcleral blood-vessels, and profuse lachrimation accompany the abscess.

Course.—Most cases require several weeks for complete recovery. As a rule the abscess ruptures outwardly; occasionally inwardly, discharging the pus into the anterior chamber causing hypopyon and in some cases suppurative panophthalmitis. Corneal ulcer may result from the abscess.

Prognosis.—On account of the danger of serious complications, the prognosis should be guarded. It is possible for the corneal abscess to heal without trace.

Treatment.—To remove surface infection warm, antiseptic solutions (boric acid, 2 per cent; ichthyol, 3 per cent) may be used. Pain is controlled by cocaine, stovaine, alypin or codrenin. The abscess may be opened under strict antiseptic precautions and the cavity treated with protargol solution (5 per cent). Treatment should be made daily.

Keratitis Neuroparalytica.—**Definition.**—A rare affection in animals due to a paralysis of nerves (trigeminal, ciliary) leading to undue exposure of the cornea. (See larger works.)

Keratitis from Lagophthalmus.—**Definition.**—An inflammation of the cornea resulting from incomplete closing of the eyelids. The portions of the cornea not protected by the lid become dry, opaque, and ulcerated. Hypopyon, iritis and panophthalmitis frequently result.

Treatment.—Besides keeping the parts lubricated with glycerized antiseptics nothing can be done.

FOREIGN BODIES AND WOUNDS OF THE CORNEA

Foreign bodies frequently enter the eyes of animals. Occasionally they become imbedded producing usually infected wounds of the cornea. Wounds also result from bites or scratches of other animals.

Symptoms.—The symptoms of laceration, photophobia and pain develop suddenly following the injury. The examination of the eye should be made thoroughly, everting the lids and nictating membrane, in order that foreign bodies will not be overlooked. It is advisable to use a local anesthetic in making such an examination.

Prognosis.—Providing too much injury has not been wrought by the offending foreign body, the prognosis is favorable. In making the prognosis one should bear in mind complications resulting from probable infection.

Treatment.—Flush the eye with mild antiseptic solutions (boric acid, 2 per cent; ichthyol 2 per cent; chinosol, 1 to 2000). Foreign bodies must be removed. Further treatment will depend upon the progress of the case. The affected eye should be watched carefully and threatened complications promptly treated. Some wounds require careful handling in order to prevent perforation.

OPACITIES OF THE CORNEA

Most opacities of the cornea result from inflammation. Those resulting from other causes are very rare in animals, although sometimes due to a vitamin deficiency. The majority follow wounds, ulcers, irritant chemicals instilled into the eye, or burns.

Depending upon their density, various terms have been applied to opacities: (a) nebula, a slight turbidity. The cornea appears blue or slightly foggy. (b) Macula, a denser opacity easily seen in ordinary light. It may be milk white. (c) Albugo, a translucent opacity. (d) Leukoma, the entire cornea becoming turbid, milk white. It may be either congenital or acquired.

Prognosis.—The prognosis depends upon the age of the patient, duration, location, extent and character of the opacity. The more recent the opacity, the more favorable the prognosis. Superficial opacities are more readily removed than deeper ones. However, the prognosis should be guarded.

Treatment.—As most opacities of the cornea are composed of cicatricial tissue complete removal of them is very difficult. However, some of them will entirely disappear and the cornea reassume its former transparency. The following agents are recommended: Quinine bisulfate ointment is highly recommended. Diouin solution (5 to 10 per cent), or in the form of powder, has given excellent results. Begin with a few drops of a 5 per cent solution instilled two or three times daily. The strength of the

preparation may be increased later if necessary. A severe reaction usually follows the first treatments. This disappears later when the strength of the solution can be increased. Red or yellow oxide of mercury ointment has also been used with good results. A small quantity is applied once daily. Silver nitrate solution (4 per cent), or protargol (10 per cent) is used to stimulate greater cellular activity in the region of the opacity. Sterile milk may also be used subcutaneously. *Succus cineraria maritima* compositus is also of value. To obtain results treatment must be continued for a long time. As a last resort, when medical treatment does not suffice, iridectomy may be tried. The operation consists in making an artificial pupil so situated that light may reach the retina. Since some opacities seem to be brought about by deficiencies in diet it is well to see that all the necessary elements in a well balanced diet are supplied.

ECTASIA OF THE CORNEA

Two types of ectasia are recognized: (a) inflammatory ectasia, and (b) non-inflammatory ectasia.

Inflammatory Ectasia.—Two forms occur in animals, viz.: staphyloma, and keratectasia.

Staphyloma.—*Definition.*—A protrusion of the cornea, the result of inflammation (ulceration, perforation, prolapsus of iris). Staphyloma may be partial or complete; in form spherical or conical. In animals it is usually complete, the entire cornea protruding from the scleral margin. In color it is blue or black due to cellular infiltration and pigment deposit. The protrusion may interfere with the closing of the lids. Lacrimation, photophobia and pain are prominent symptoms. In the incomplete form (conical) only a portion of the cornea protrudes.

Treatment.—Treatment is usually unsatisfactory. The cause should be removed if possible. Apply gentle pressure to the eye through antiseptic packs retained with a head bandage. When the intra-ocular pressure is too great, some of the fluid from the anterior chamber may be aspirated before applying the pack. Permanent satisfactory results can hardly be hoped for. When other treatment fails the affected eye should be enucleated.

Keratectasia.—*Definition.*—Keratectasia involves only the cornea which has become weakened at some point either from infiltration or from an ulcer which has not perforated its entire thickness. In keratectasia the iris is not involved as in staphyloma.

Treatment.—Relieve the intra-ocular tension and apply a compress. Iridectomy may be useful in some cases.

Non-inflammatory Ectasia.—Two forms are recognized: keratoconus, and keratoglobus.

Keratoconus.—A cone-shaped protrusion of the cornea which does not become opaque. It results from a weakening of the cornea at its center and an increase in intra-ocular tension. The condition is incurable.

Keratoglobus.—The entire cornea is enlarged as the result of a general increase in size of the entire eyeball. It is seen in hydrophthalmus. The cornea retains its transparency. The condition is usually congenital and most often observed in young dogs and young cats.

Treatment.—No treatment is of any value.

TUMORS OF THE CORNEA

Tumors of the cornea are rare in animals. Dermoids are occasionally met with on dogs and cats. Sarcomata and carcinomata have been noted. They usually originate either in some other part of the eye or in adjacent tissues.

Treatment.—Surgical treatment should be attempted as early as possible. No treatment should be attempted in malignant tumors.

CHAPTER V

DISEASES OF THE IRIS AND CILIARY BODY

General.—In practice it is very difficult to separate the diseases of the iris and ciliary body of which the iris is practically an extension. The structure of the iris is much the same in all animals. The arrangement of its muscular fibers in different animals accounts for the variation in the shape of the pupil. In the cat the pupil is an elongated slit; in dogs it is spherical or oval.

The color of the iris is due to the quantity of pigment present in the posterior layers and in the membrane proper. Frequently the pigment is entirely absent producing the albino or pink eye. This is common in rabbits and is occasionally observed in other animals. The other colors, such as blue, black or gray eyes, are determined by the amount and distribution of the pigment. A more complete examination of the iris can be made if a few drops of eserine are instilled into the eye to contract the pupil. The examination should be made for congenital defects, inflammations, tumors, etc.

CONGENITAL DEFECTS OF THE IRIS

A number of defects in the formation and development of the iris have been observed: (a) occlusion of the pupil, occurring in the dog, cat and rabbit, causing congenital blindness. (b) Ectopia pupillæ, a displacement of the pupil often found accompanying luxation of the lens. (c) Coloboma, a portion of the iris failing causing a large, irregular-shaped opening. (d) Aniridia, absence of the iris, very unusual in animals. Treatment for these conditions is unsatisfactory. The size and form of the pupil are influenced by light, disease and medication.

MYDRIASIS

Definition.—A dilatation of the pupil. It may be due to: (a) paralysis of the third nerve, (b) disease of the central nervous system, (c) constitutional diseases, (d) poisons, (e) mydriatics.

Mydriasis is produced artificially in order to examine the interior of the eye.

MYOSIS

Definition.—A contraction of the pupil. It is caused by paralysis of the cervical sympathetic nerves, tabes dorsalis, inflammation of the iris, foreign bodies in the cornea and by myotic drugs (morphine, cocaine, eserine). It is frequently noted in rabid animals.

IRITIS AND CYCLITIS (IRIDOCYCLITIS)

Definition.—An inflammation of the iris and of the ciliary body. They usually coexist and will be therefore considered together (iridocyclitis).

Etiology.—Traumatism. A primary iridocyclitis is not common. Most cases are secondary to other diseases, such as distemper of the dog and cat.

Symptoms.—Iridocyclitis is characterized by congestion, discoloration, loss of the normal striations and inability of the iris to react to light or other stimuli. The pupil is usually found contracted. While it is possible for the iridian exudate to be very limited, the inflammation stopping in the congestive stage as a rule, it is profuse, falls off the iris and accumulates in the anterior chamber (hypopyon if purulent). The exudate, which is usually fibrinous, may be seen through the cornea as a movable, yellow, sometimes blood-streaked accumulation floating in the anterior chamber. If an adhesion between the iris and the cornea results, anterior synechia is spoken of; if between the iris and lens, posterior synechia. Symptoms of laceration, photophobia and congestion of the conjunctiva are usually present. The cornea is nearly always involved, appearing as if lightly greased over its surface. When the ciliary bodies are prominently involved a turbidity of the corneal margins is noted. Exudate, which has passed through the pupil, reaches the anterior chamber producing the same symptoms as iridian exudate. The iris may be only slightly involved as is determined by its color, striations and reaction to light.

Course.—The course in iridocyclitis is usually short. The inflammation rapidly subsides and the exudate is quickly resorbed. A few cases become chronic and lead to posterior synechia.

Prognosis.—In uncomplicated cases the prognosis is favorable. When the choroid or retina is involved the prognosis is guarded.

Treatment.—When secondary to constitutional diseases, distemper, etc., these should receive attention. Local treatment consists in instilling atropine solution (0.5 to 1 per cent) once or twice daily, which paralyzes the accommodation, relieves pain and congestion and prevents adhesions. Dionin solution (4 per cent) is also useful to stimulate the lymph circulation. Hot applications in the form of a hot-water compress are of great service. They should be applied for an hour at a time during the first twenty-four to thirty-six hours. Antiseptic and astringent solutions, such as succus eimeria maritima compositus (50 per cent), or ichthyol (4 per cent) may also be used. Complications should be treated as they arise.

CYSTS AND TUMORS OF THE IRIS

Cysts involving the iris are quite rare. They most often result from injury and appear as enlargements on the iris. It is difficult to distinguish between cysts and tumors. They are treated by puncturing, under antiseptic precautions, with a knife needle inserted through the corneal margin.

Both benign and malignant tumors may involve the iris. Melanoma is the most frequent primary tumor. Sarcomata and carcinomata also occur. They usually extend from adjacent structures which are their primary seats. Treatment consists in enucleating the eyeball.

CHAPTER VI

DISEASES OF THE LENS

Examination.—The lens is best examined after dilating the pupil with atropine. The patient should be placed in a good light or light may be reflected with an ophthalmoscope against the lens. Normally the lens is transparent. It should be examined for turbidity, position and form. In old dogs the lens is usually less transparent than in younger animals.

CATARACT

Definition.—An opacity of the lens, its capsule or both. Cataract is common in the dog and cat, especially in old animals. The following kinds occur: (a) symptomatic, (b) traumatic, (c) senile, (d) diabetic, (e) congenital.

Symptomatic Cataract.—This form results from an inflammation of some of the adjacent structures which interferes with the nutrition of the lens. In the dog and cat it often develops from distemper.

Traumatic Cataract.—Traumatic cataract is caused by injury to the lens by sharp objects which penetrate the cornea. Or it may be due to indirect injury, the animal receiving a blow which jars the lens from its fastenings. It may, therefore, result from fracture of the orbit or some of the other bones of the head.

Senile Cataract.—Common in old dogs. It is due to an atrophy of the lens and is usually bilateral. In the early stages senile cataract usually appears as radiating, gray lines which extend from the periphery to the center of the lens. In other cases it may occur as an opaque spot or spots in the lens. The opacity spreads until eventually the entire lens is involved.

Diabetic Cataract.—Very rare in animals. A few cases have been noted in dogs.

Congenital Cataracts.—Quite common in young dogs. As a rule, the lens only is involved. It is often bilateral. It may be partial or complete.

Symptoms.—General.—In animals cataract is usually overlooked until it becomes so well marked as to be visible to the ordinary observer. Partial cases are sometimes discovered during an examination of the eye for some other disease. In using the ophthalmoscope in cataract the light should not be too strong. Under subdued light the opacity appears as a dark spot, its color differentiating it from the tapetum lucidum or the red papilla. Cataract should be distinguished from foreign bodies on the cornea, corneal opacities and turbidity of the vitreous humor. In most cases a careful examination with an ophthalmoscope will suffice to differentiate between lens opacities and those in other parts of the eye. When the diagnosis of cataract has been made, the form and cause should be determined whenever possible. The history of the case, the age and condition of the patient, and the appearance of the opacity are indicative.

Course.—The course in cataract is chronic, usually leading to complete loss of vision. Occasionally a traumatic cataract develops rapidly and undergoes a spontaneous recovery within a short time. Such cases are rare.

Prognosis.—The prognosis is unfavorable.

Treatment.—The only treatment of value is an operation to remove the lens. In veterinary practice the difficulty in keeping the parts aseptic, the dressings in place and the patient quiet, is so great that cataract operations are seldom employed. There are two operations for cataract: (a) a dissection of the lens, and (b) extraction of the lens.

Discission.—Discission is practised only in congenital cataract, or when cataract appears early in life, is soft and capable of absorption. The operation is performed under complete anesthesia and strict asepsis. The eye to be operated on is flushed out with an antiseptic solution (boric acid, 2 per cent; bichloride of mercury, 1 to 5000), followed by a solution of atropine (1 per cent) to dilate the pupil. The lids are held open with an eye speculum. With a special instrument, a small knife-needle, which is passed through the cornea at its margin and pushed diagonally through the lens capsule into the lens proper, the lens is cut and separated. The instrument is then withdrawn carefully so as to avoid injury to the cornea. An absorption of the lens should follow. If not, the operation may be repeated in a few weeks.

Complications, such as swelling of the lens and increased intra-ocular tension with severe pain, may follow the operation. Cold packs are recommended to reduce the swelling. If they afford no relief within a short time the cornea may be punctured at its margin which relieves the tension. Through the same opening the lens substance may be removed. If iritis result from particles of the lens coming in contact with the iris, instil atropine solution and apply hot packs.

Extraction.—The lens is extracted in all cases when the discission operation is contra-indicated. The technique of the operation is rather difficult and requires much practice. It consists briefly in incising the cornea in the sclerocorneal limbus, fixing the eyeball with a special fixation forceps, incising the capsule of the lens, and expressing the lens. The eye should be cleansed and a dressing applied. Many complications may follow the operation in animals: panophthalmitis, prolapse of the iris; iritis and cyclitis in a small percentage of cases. Proper and careful dressing of the wound after the operation is especially important.

LUXATION OF THE LENS

Luxation is not very frequent in small animals. In most instances it results from traumatism. It may be due to extreme intra-ocular tension in either chamber of the eye, or from rupture of the suspensory ligaments of the lens. The luxation may be partial or complete; into the anterior or posterior chamber.

Treatment.—Treatment is of no value. A removal of the lens is occasionally employed.

CHAPTER VII

DISEASES OF THE RETINA AND CHOROID

THESE membranes can be seen only with the ophthalmoscope. It is best to dilate the pupil in order to increase the size of the field of the eye's background.

The following pathological changes may be noted on the retina: (a) hyperemia, (b) edema, (c) inflammation (retinitis), (d) detachment of the retina, (e) anemia, (f) atrophy.

Hyperemia.—A congestion of the retina. The blood-vessels will be found dilated and engorged with blood.

Edema.—Rare in animals. It may result from direct injury, or inflammatory exudate which collects in the retina. The retina appears cloudy.

Inflammation (Retinitis).—An inflammation of the retina. It usually develops during or as a sequel to infectious or chronic constitutional diseases. It is characterized by hyperemia, edema, partial or complete obliteration of the papilla and hemorrhage.

Detachment of the Retina.—Rare in animals. It may result from an accumulation of exudate or transudate between the retina and choroid, which causes the retina to become detached and float loose in the vitreous humor. It causes partial or complete blindness.

Anemia.—Retinal anemia usually results from general hemorrhage; obviously it accompanies general anemia. It may have a local origin, the blood-vessels supplying the retina becoming blocked and pressed upon by tumors or inflammatory growths. The retina appears pale and the blood-vessels reduced in size.

Atrophy.—Usually follows extensive and severe retinitis; or when the nutrition of the retina has become reduced. The blood-vessels appear unusually small; in some cases hardly visible.

The diseases of the choroid are so intimately interwoven with those of the other membranes that a separate description is unnecessary.

CHAPTER VIII

DISEASES OF THE OPTIC NERVE

USUALLY when the optic nerve is affected diseases of other structures, particularly of the retina, coexist.

The principal pathological changes affecting the optic nerve are: (a) wounds, (b) hemorrhages, (c) inflammation, (d) tumors.

The optic nerve is also affected by inflammation of adjacent structures, and diseases of the central nervous system.

The diseases of the optic nerve usually noted are: (a) papillitis, (b) retrobulbar neuritis, (c) atrophy. Clinically amblyopia and amaurosis are recognized.

PAPILLITIS

Definition.—An inflammation of the papilla. It may be unilateral or bilateral. It is usually caused by poisons, traumatism and diseases of the central nervous system. Viewed with the ophthalmoscope the papilla appears either enlarged and engorged with blood or, on the other hand, too pale—even white in color. Its outline is usually indistinct and striations are seen radiating from its center. When due to tumors and marked congestion is present, the papilla appears intensely red (“choked disk”).

Prognosis.—The prognosis is unfavorable. Partial or complete blindness will usually result.

RETROBULBAR NEURITIS

Definition.—An inflammation of the optic nerve just posterior to its entrance into the eyeball. It may result from injuries, infection through wounds involving the orbit; or attend nasal catarrh, or dog distemper which has attacked the sinuses of the head. The patient is partially or totally blind. The papilla will appear congested. Many cases will recover when the cause is removed.

ATROPHY OF THE OPTIC NERVE

Definition.—It may result from inflammation or be a simple atrophy. Blindness is a prominent symptom.

Prognosis.—The prognosis is unfavorable.

AMBLYOPIA

Definition.—Partial blindness. No lesion can be determined. In animals it usually results from poisoning. As a rule when the cause is removed sight is restored.

AMAUROSIS

Definition.—Blindness without visible lesion of the eye. Amaurosis is symptom and not a disease. The term is falling into disuse as ophthalmoscopy becomes better developed. It may be congenital or acquired. Diseases of the optic nerve, retina, brain and certain poisons are its principal causes. The symptoms are blindness, abnormal dilatation of the pupil which does not react to light. In the early stages the eye appears normal but in time the globe becomes atrophic. Ophthalmoscopic examination may be negative, although usually changes can be noted on the retina or papilla. There is no treatment of value. Cases due to poison may recover.

CHAPTER IX

DISEASES OF THE GLOBE AND ORBIT

INJURIES to the eyeball are very common. They occur as wounds, lacerations and contusions. Sometimes the eyeball is ruptured. Diseases involving the globe and orbit are also frequent. The following are the most important: (a) panophthalmitis, (b) glaucoma, (c) hydrophthalmus, (d) exophthalmus, (e) luxation of the eyeball, (f) enophthalmus, (g) strabismus, (h) nystagmus, (i) parasites, (j) fracture of the orbit, (k) inflammation of the orbit, (l) tumors of the orbit.

PANOPHTHALMITIS

Definition.—An inflammation of the entire eyeball. It is usually due to injury with infection, or may develop during the course of infectious diseases, the infection being carried to the eye by the blood or lymph.

Symptoms.—The initial symptoms will vary, depending upon whether the infection enters through wounds (exogenetic) or is carried by the blood or lymph (endogenic). When panophthalmitis begins in the posterior part of the eye it may escape attention until the anterior portion is involved. In cases of exogenetic origin usually a wound through the cornea or sclera is found, out of which pus discharges. In endogenic infection a general congestion of the eyeball is an early symptom. As the disease progresses perforation usually through the cornea with prolapsus of the iris and sometimes the lens follows. As a rule, the eyeball is destroyed.

Diagnosis.—Panophthalmitis should be differentiated from pblegmonous conjunctivitis and inflammation of other parts of the eye. These sometimes present symptoms confusingly like it. The eye should be carefully examined to avoid error in this regard. Should a perforating wound be found the diagnosis is simplified.

Prognosis.—Unfavorable. Almost every case leads to destruction of the eyeball.

Treatment.—An effort should be made to arrest the spread of the infection. Obviously as the deeper structures are involved this is difficult to accomplish. The eye should be flushed with warm antiseptic solutions (boric acid, 2 per cent; ichthyol, 3 per cent). Subconjunctival injections of 1 to 2 cc. of a solution of cyanide of mercury (0.5 per cent) are recommended. Suppurating wounds should be drained and flushed out. Usually enucleation of the eyeball becomes necessary.

GLAUCOMA

Definition.—A term applied to a number of diseases of the eye marked by intense intra-ocular tension, atrophy of the papilla and blindness. It is rare in animals. It is supposed to be due to some disturbance in the lymph or blood circulation of the eyeball which may be congenital or acquired.

Symptoms.—Glaucoma develops gradually without signs of inflammation and with little evidence of pain. The early stages are often overlooked. As the disease progresses the pupil dilates and a marked hardness of the

eyeball develops due to increased intra-ocular pressure. The cornea may be clear or cloudy. With the ophthalmoscope the optic nerve appears cupped. The vision is gradually destroyed. In some cases (inflammatory glaucoma) acute inflammatory symptoms suddenly develop.

Prognosis.—Bad.

Treatment.—Eserin or pilocarpin should be tried; if unsuccessful relieve the intra-ocular pressure by paracentesis of the anterior chamber of the eye. The results are usually unsatisfactory.

HYDROPTHALMUS

Definition.—An enlargement of the eyeball in all its dimensions. It is common in pups and kittens. Hydrophthalmus develops slowly, the eyeball enlarging, the curvature of the cornea becoming weaker, the pupil dilated, intra-ocular pressure increased, and the papilla cupped. The condition is usually congenital.

Treatment.—Eserin and pilocarpin are recommended, but they do little good. Paracentesis of the anterior chamber will relieve intra-ocular pressure as in glaucoma. Iridectomy may be tried.

EXOPHTHALMUS

Definition.—An abnormal protrusion of the eyeball. It should not be confused with normally prominent eyeballs of some breeds of dogs.

Etiology.—Fracture of the orbital arch, the displaced bones forcing the eyeball outward; edema, abscess or hematoma in the postbulbar tissue; retrobulbar cellulitis; intra-orbital tumors; tuberculous growths in the orbit. Exophthalmus is a prominent symptom of exophthalmic goiter in dogs.

Symptoms.—One or both eyes appear unduly prominent. As the eyelids do not entirely cover the eye the surface of the cornea becomes dry and ulcerated.

Prognosis.—The prognosis should be guarded.

Treatment.—Treatment is only successful when the cause can be removed. Tumors should be operated, enlarged thyroids removed and the affected eyeball protected.

LUXATION OF THE EYEBALL

Common in the dog and cat. Dogs with prominent eyes are predisposed. It results from injury, fighting, becoming caught in doors, etc.

Prognosis.—The prognosis will depend upon how long the eye has been prolapsed, the degree of injury to the optic nerve and to the eyeball.

Treatment.—The patient should be anesthetized and the prolapsed eye flushed with a warm antiseptic solution (boric acid, 2 per cent). Try replacement by picking up the eyelids, retracting them as much as possible, at the same time gently but firmly pressing the eyeball back into its socket. It may be necessary to enlarge the palpebral slit by cutting the outer canthus. After replacement two or three stitches will retain the eyeball in position. The after-treatment consists in fomenting the eye with warm water and keeping it lubricated with dilute glycerin or liquid vaseline. Should panophthalmitis or hydrophthalmitis develop, or the luxation reappear, enucleation of the eyeball should be practised. The operation is as

follows: the patient should be given a general anæsthetic and the eyeball thoroughly washed with an antiseptic. The eyelids are brought together with interrupted sutures leaving the suture which is midway between the internal and external canthus with ends sufficiently long so that they may be tied together forming a loop.

Shave the hair from the eyelids and render the skin aseptic. An incision approximately $\frac{1}{4}$ inch from the margin of the eyelids and extending all the way around is made through the skin. Traction is now exerted by means of the loop just mentioned and the conjunctiva is separated from the surrounding tissues.

The muscles, nerve and vessels are severed as they are encountered.

Hæmorrhage is controlled by packing the cavity with narrow gauze which may be saturated with ichtholdine. The end is left in the region of the inner canthus so that it may be readily removed. The incised margins of the eyelids are carefully sutured using interrupted sutures, being careful not to include in them any portion of the gauze pack.

The pack may be removed in twenty-four to forty-eight hours by removing one suture at the inner canthus. Healing of the skin should be by first intention the remaining sutures being removed in from five to six days.

After-treatment may consist of cleansing externally and the injection of a small amount of ichtholdine through the opening formed for the removal of the pack.

Healing is usually prompt.

ENOPHTHALMUS

Definition.—An abnormal sinking of the eyeball into the orbit. It is rare in animals.

Etiology.—It may be congenital. Most cases, however, are acquired and due to an atrophy of the retrobulbar fat cushion, general emaciation, spasms of the muscles of the eye.

Symptoms.—The eyeball appears retracted into its socket. It should be distinguished from normal eyes which are unusually small. The general condition of the patient suffices for differentiation.

Prognosis.—Depends upon the cause.

Treatment.—Determine the cause and eliminate it by proper treatment.

STRABISMUS

Definition.—A deviation of one of the eyes from its normal direction so that the visual axes cannot be focussed simultaneously on the same objective point.

Etiology.—It may be due to a mechanical interference with the movement and position of the eyeball, paralysis of the muscles of the eye, intra-cranial paralysis, spasms of the eye muscles, cerebral hæmorrhage, and poisoning.

Diagnosis.—The diagnosis is not difficult. One eye will be turned inward or outward while the other one is directed straight ahead.

Treatment.—A palliative treatment consists in applying a counterirritant to the region of the orbit and administering internally small doses of iodide of potash. A radical treatment is to perform a tenotomy, severing one of the tendons of the eye muscle at its insertion into the sclera. The particular

tendon to be divided is determined by the individual case. If the strabismus is convergent the internal rectus is cut; if divergent, the external. The operation is briefly as follows: give a general anesthetic. Flush the eye with antiseptics and follow by a solution of codrenin to control the hemorrhage. Cut through the conjunctiva and carefully dissect down to the tendon, then grasp with a blunt hook, pull forward and cut off with a scissors. Unless the tendon is entirely severed the results will not be satisfactory. The wound in the conjunctiva may be left open. Flush out daily with antiseptic solution.

NYSTAGMUS

Definition.—A continuous rolling movement of the eyeball. It occurs occasionally in dogs. It very often accompanies epilepsy, convulsions, parasitic invasion of the ear, catarrh of the ear and sometimes accompanies chloroform narcosis.

Treatment.—No treatment beyond rectifying the primary condition of which it is a symptom is recommended.

PARASITES OF THE EYE

Lice (pediculi) are often found on the margins of the lids and on the skin over the orbital region. Mange mites also invade the lids. The demodex mite may enter the Meibomian glands, conjunctiva and lacrimal apparatus. *Thelazia californiensis* has been found in a number of cases from dogs in the state of California.

FRACTURE OF THE ORBIT

Common in animals. Careful palpation will reveal crepitation.

Treatment.—Treatment should follow the general principles of surgery. Possible injury to the eyeball demands first consideration.

INFLAMMATION OF THE ORBIT

Usually results from traumatism. Due to the abundance of fat, inflammation of the orbit spreads rapidly and always endangers the optic nerve and eyeball. It is usually difficult to obtain proper drainage or to apply antiseptics to stop the progress of the inflammation. An attempt should be made, however, to secure drainage and keep the parts clean.

TUMORS OF THE ORBIT

Infrequent. Sarcomata, carcinomata, epitheliomata and osteomata have been noted in this region. It is usually necessary to enucleate the eyeball in order to remove them. Malignant tumors are apt to recur.

PART XIII

HERNIA

Definition.—The term hernia is applied to a protrusion of a portion of the abdominal contents through a normal or an abnormal opening in the abdominal wall. The larger number of hernias are found under the skin, the smaller through the diaphragm.

Occurrence.—Hernia is very frequent in the dog and cat but rather rare in other small animals.

General Remarks.—Hernia may consist of a portion of the bowel (enterocele), a section of the omentum (epiplocele), or a combination of both (entero-epiplocele); further, a portion of the uterus may be protruded (metrocele), or the uterus and its ligamentous attachments (metro-mesometrocele). Some of the other organs are occasionally found in the hernial sac, such as the liver (hepatocoele), etc. In the dog it is possible to find almost any one of the organs of the abdominal cavity present in the hernial sac. The number and forms of hernia are quite varied.

The following parts are distinguished in a hernia: (a) hernial sac, (b) hernial ring, (c) hernial contents.

(a) The hernial sac consists of the skin, subcutaneous cellular tissues, and in most cases the peritoneum. Sometimes the peritoneum is ruptured and when this occurs the skin and subcutaneous tissues constitute the hernial sac.

(b) The hernial ring is the opening through which the contents pass from the abdominal cavity. In recent hernias the ring is made up of the margins of the muscular tissue, and its size is determined by the rent in the abdominal wall. In old cases connective tissue elements form around the margins which results in a distinct, firm ring. Palpation of a hernia will often reveal a well defined, firm enlargement which will serve to differentiate recent from long standing cases.

(c) The contents of a hernia are quite varied and will depend somewhat on its location. In most cases they consist of a portion of bowel, or omentum, or both. In a smaller number a portion of one or the other abdominal organs is present, such as the liver, stomach, spleen, uterus or bladder. When the contents fluctuate on palpation it may be due to the fluid content in the loop of bowel, or to serum which accumulates from a venous stagnation of the imprisoned contents.

From a practical standpoint it is important to classify hernias into (a) reducible and (b) irreducible.

hernial sac and its contents which will interfere with complete reduction of the enlargement. In this case, as soon as pressure is removed from the outside, the hernial contents will again reappear in the sac. Practically all reducible hernias return unless outside pressure is maintained.

(b) Irreducible hernias are those which cannot be returned by manipulation to the abdominal cavity. This condition may be brought about by adhesions between the different parts of the hernia, by swelling around the hernial ring, or by strangulation with subsequent swelling of the hernial contents. When a loop of bowel is present in the hernial sac strangulation frequently occurs from fecal matter accumulating and distending the prolapsed bowel. It is very important to distinguish between strangulated and non-strangulated hernias. The differentiation is made very definitely by the symptoms shown by the patient and the local examination of the hernia. Marked symptoms of pain, vomiting, and local inflammation indicate strangulation. During the secondary stages of its development the hernial sac becomes cold, doughy, and non-sensitive to the touch. Fecal fistulæ (intestinal fistulæ) occur in some cases from a sloughing of a portion of the intestine.

Forms.—The following are the most common hernias found in small animals: (a) umbilical, (b) ventral, (c) inguinal, (d) femoral, (e) diaphragmatic, and (f) perineal.

Umbilical Hernia.—**Etiology.**—This form occurs either congenitally (usual) or a short time after birth. The hernial ring is formed by an improper closure of the umbilicus, or the fibrous organization being of insufficient strength allowing the abdominal contents to pass through. Occasionally umbilical hernia occurs accidentally in which case the peritoneum forms the inner portion of the hernial sac.

The hernial contents may consist of omentum, small or large intestines, or both. In most cases in puppies the sac contains only omentum.

Symptoms.—The presence of an enlargement at the umbilicus which may be soft or firm, depending on the contents and local conditions. In most cases the contents can be readily returned to the abdominal cavity. Occasionally adhesions are present which prevent this. Strangulation is very rare in this type of hernia.

Treatment.—In puppies many cases disappear spontaneously. Several methods of procedure in treatment have been recommended:

(a) Pressure bandage, or adhesive tape, applied over the part for a few days has proved satisfactory in many cases. This method keeps the contents in the cavity, allowing time for fibrous tissue organization to close the ring.

(b) **Operation.**—When adhesions are present or the ring is of considerable size, it is advisable to perform herniotomy. The animal is anesthetized, placed in a dorsal position on the table, the hair removed from the area and painted with tincture of iodine. An incision is made through the skin of sufficient length, dissecting the hernial contents from the adjacent tissues, if necessary, carefully so as to avoid injuring the bowel. If omentum only is present it may be removed with knife or scissors. Return the contents to the abdominal cavity. Remove a small portion of the hernial ring on either side making a fresh wound surface to facilitate union of the parts. Suture the wound and apply after-treatment as in laparotomy (see Laparotomy).

Ventral Hernia.—**Definition.**—Ventral hernia is a term applied to a subcutaneous rupture of the abdominal muscles which permits the abdominal contents to pass through. This may occur at any point in the abdominal walls. The hernial sac consists of the peritoneum, subcutaneous tissue and the skin in the majority of cases. Sometimes the peritoneum is also ruptured allowing the contents to lie immediately under the skin.

Etiology.—The cause of ventral hernia is usually traumatic, or intra-abdominal pressure. In some instances when incomplete union of the abdominal muscles takes place following surgical operations, a hernia will develop.

Symptoms.—The sudden development of an enlargement appearing at some point in the abdominal wall. The size of the hernia will depend upon the extent of the rent in the abdominal muscles. Palpation of the enlargement will reveal a soft, fluctuating or elastic mass which can be reduced in most cases except when strangulated. When reduction is brought about the opening through the abdominal muscles can be easily determined and the margins of the hernial ring felt. Changing the position of the patient will bring about reduction except when adhesions are present or the parts strangulated. Unless the hernia is very recent or strangulated, there will be no inflammation nor pain present on manipulation. It is necessary to differentiate recent hernia from abscess. This can be done by careful palpation or by explorative operation. Some difficulty will be experienced in distinguishing between incarcerated hernia and tumors. However, the consistency, location and an explorative operation if necessary, will serve to make the distinction. A strangulated ventral hernia will be characterized by symptoms of inflammation, doughy consistency, pain on palpation and the general reaction of the patient.

Treatment.—After the examination has been made carefully to determine the exact conditions, then it is possible to decide on the method of procedure. Treatment in ventral hernia should be operative. There is very little danger providing the usual precautions are observed in opening the abdominal cavity.

In ventral hernia without strangulation or incarceration the operation is performed as follows: the animal is given a laxative and fasted for twenty-four hours. The field of operation is shaved and an antiseptic pack applied for the same period. The animal is then given an anesthetic, placed on the operating table in an advantageous position, the pack removed and the surface painted with tincture of iodine. A longitudinal incision is made immediately over the hernia through the skin and parallel to the rent in the abdominal wall. The hernial contents are returned to the abdominal cavity. It is advisable to open the hernial sac in order to determine the condition of the hernial contents. When they are found normal and there is no evidence of injury to the structures, the hernial sac can be trimmed off with the scissors and the rent in the abdominal wall sutured. If the hernial ring indicates fibrous tissue formation, it is advisable to trim off the margins with a scissors or knife to produce a fresh wound surface for approximation. The abdominal wound is then closed as in laparotomy (see Laparotomy).

In strangulated ventral hernia treatment should be attempted as early as possible. The same precautions should be observed as above and the contents examined to determine the cause of the strangulation and the

condition of the contents of the hernial sac. If the strangulation is produced by a constricted ring it should be enlarged with a probe-pointed knife sufficiently to allow the contents to be returned to the abdominal cavity. The wound in the wall is closed in the usual manner. If the hernial contents have been strangulated and retained until gangrenous then proper treatment should be employed. A section of bowel or omentum may be removed without difficulty and successfully when properly done. Adhesions when present should be carefully broken down to allow the contents to be returned. Some of these cases may present special problems and, therefore a careful examination of the contents should always be made. The after-treatment would consist of keeping an antiseptic pack in contact with the wound for a few days until union takes place. There is a possibility of a recurrence of the condition if union of the abdominal wall is incomplete. Reoperation is recommended when this occurs.

Inguinal Hernia.—It is necessary to divide this form of hernia into two classes on account of the anatomical differences in the female and male animal: (1) inguinal hernia in the female, and (2) inguinal and scrotal hernia in the male.

1. **Inguinal Hernia in the Female.**—*Etiology.*—A very common form of hernia. The inguinal canal in the female is very short and the diameter usually greater than in the male animal. During pregnancy considerable strain is thrown upon these structures resulting in a hernia. It may result also from increased intra-abdominal pressure, from ascites, distention of the organs, or hypertrophy. Congenital inguinal hernia in the female has been observed.

The hernial contents consist of the round ligament with peritoneum, or one or both cornua of the uterus. In a smaller number of cases other abdominal organs may be present.

Symptoms.—An enlargement appearing just posterior to the inguinal mammae. It varies in size from a small, rounded mass to one of sufficient proportions to reach the ground. The consistency of the hernia will depend on its contents, sometimes fluctuating, at other times firm. When the animal is pregnant the fetuses may be palpated in the hernial sac. The contents, if no adhesions are present, may be easily pushed back into the abdominal cavity and the hernial ring distinctly felt. Placing the dog in a dorsal position with the hind limbs elevated often will effect replacement. Further, there is no symptom of inflammation and the parts are non-sensitive on palpation. All enlargements appearing in this location should be examined from the standpoint of hernia as it is not always possible to reduce them and palpate the ring.

Treatment.—Operation is advised in all cases. Herniotomy is performed in the following manner: the animal should be properly prepared by fasting and administration of a laxative twenty-four hours in advance. The operative field should be shaved and disinfected. Make an incision longitudinally over the enlargement through the skin and hernial sac. If no adhesions are present and the contents capable of being replaced this should be done at once. If adhesions are present preventing reduction they must be carefully broken down when the contents will return easily. Sometimes the bladder is encountered considerably distended with urine. If this is the case, introduce a trocar and draw off the urine which facilitates replacement. When the gravid uterus is found in the sac it will be

necessary to remove the fetuses in the usual manner and return the cornua to the abdominal cavity. After reduction has been brought about the hernial sac should be ligated as close to the cavity as possible and removed, pushing the stump into the cavity. Suture the ring by inserting the sutures close together, keeping away from the pudic veins. The extra skin which will be present should be properly trimmed off with the scissors and sutured. An antiseptic pack is applied, renewed daily, and kept in position until union is complete. The external sutures should be removed when the wound is healed.

2. **Inguinal and Scrotal Hernia in the Male.**—*Etiology.*—Inguinal hernia is not as common in the male animal although it is met with occasionally. Dilatation of the inguinal canal from any cause will allow the intestines or omentum to pass through carrying a portion of the peritoneum with it forming an inguinal hernia.

Scrotal hernia is far more common in the male animal. The hernial sac is formed by the processus vaginalis, and the contents consist of omentum or a loop of bowel protruding out into the scrotum in contact with the testicle. The hernia may be unilateral or bilateral.

Symptoms.—Inguinal hernia is characterized by an enlargement appearing to one side of the penis. It is usually soft, fluctuating, and reducible. The ring can be palpated in most cases. Occasionally some difficulty in diagnosis might be met with when adhesions are present. An explorative operation is recommended. Scrotal hernia is recognized as an elongated enlargement in the scrotum. Palpation will usually reveal the dilated canal and the contents can be easily returned to the abdominal cavity. Holding the animal up by the hind limbs often effects replacement. Differentiation should be made from other scrotal enlargements. As a rule no particular difficulty will be encountered.

Treatment.—In inguinal hernia the operation would be practically the same as in the female. The same care should be exercised to avoid complications.

Diaphragmatic Hernia.—**Definition.**—A hernia taking place through the diaphragm. It may be either congenital or acquired. This hernia is characterized by the passage of a portion of the abdominal viscera into the thoracic cavity either with or without the peritoneum.

Etiology.—Most cases of acquired diaphragmatic hernia occur as a result of violence in which the diaphragm ruptures allowing abdominal viscera to pass through the rent. Strangulation is rare.

Symptoms.—No symptoms are observed in most cases of congenital diaphragmatic hernia. In the acquired form the symptoms come on suddenly and consist of severe dyspnea, restlessness, pain, etc. The patient as a rule lives but a short time. A few cases have been observed where the patients lived for several months showing dyspnea and marked circulatory disturbance. A diagnosis is in most cases difficult.

Treatment.—No treatment can be given.



FIG. 35.—Perineal hernia.

Perineal Hernia.—**Definition.**—A hernia appearing in both males and females and characterized by an enlargement on one or both sides of the anus.

Etiology.—The perineal tissue is easily ruptured or torn allowing some of the abdominal organs or omentum to protrude at the sides of the rectum. Perineal hernia is often observed in trick dogs which are required to walk a great deal on their hind legs. The unnatural position and the pressure of the abdominal organs no doubt lead to rupture of the perineal tissue. It may also result from strain from coprostatitis, prostatic enlargement, etc. Strangulation is rare in this form of hernia. In some cases torsion of the bladder accompanies it.

Symptoms.—This hernia is recognized as an enlargement appearing at one or both sides of the rectum. The majority of cases are unilateral. The anus is pushed to one side and often there is difficulty in defecation. In the female the enlargement is usually slightly lower than in the male.

The consistency of the hernia will depend upon the contents. Perineal hernias are usually soft, easily reduced and the hernial ring readily palpated. Holding the patient up by the hind limbs often effects reduction. Should the bladder be in the hernial sac the patient will show dysuria and the enlargement feel cystic. A positive diagnosis under proper precautions may be made by puncturing the swelling with a trocar and obtaining some of the contents. A differential diagnosis is necessary between the hernia and enlargement of the anal pouches. A careful examination will reveal the difference between them.

Treatment.—A careful consideration of the symptoms should be taken into account in order to determine definitely the conditions so that proper treatment can be applied. If the bladder is in the hernial sac replacement should be brought about as soon as possible. One should be careful in choosing cases of perineal hernia for surgical intervention. Unilateral cases of not too long standing are usually the more favorable. If bilateral cases are attempted only one side at a time should be operated. The animal should be properly prepared, the rectum cleaned out and packed with iodoform gauze, and the area rendered aseptic. After the patient has been anesthetized, the tuberischii is located and an incision in the form of a half circle is made about 2 inches (or further depending upon the size of the dog) lateral to the hernial enlargement using the tuberischii as the imaginary center of the half circle. The flap of skin is dissected away exposing the tensor fasciæ latæ. Without opening the sac the hernia is returned and held in temporarily with a few twenty-day chromic gut sutures. Enough of the tensor fasciæ latæ to cover the hernia is dissected away in the form of a semicircular flap. This flap is folded over and carefully sutured with twenty-day chromic gut to the fibrous bands above and below the anus and to the anal muscles thus covering the posterior portion of the ilio-rectal fossa. Hemorrhage is controlled and the skin sutured. After-care is most important. The patient should be kept absolutely quiet for a long period of time—sometimes even six months. Many cases, when of ordinary size and no particular disturbance present, should not be treated. Castration is recommended when enlarged prostates are present. In some cases it may be necessary to remove the glands. Other herniæ have been observed but they are so rare that no attempt will be made to describe them.

PART XIV

INFECTIOUS DISEASES

CHAPTER I

ACUTE GENERAL INFECTIOUS DISEASES

DISTEMPER OF DOGS

Definition.—An acute, infectious, communicable disease which in most cases affects young dogs.

Occurrence.—This is one of the most common diseases affecting dogs, and is known in every country where dogs are found. It is particularly a disease of young animals, the majority of dogs contracting it at some time during the first year of their lives. Whole litters of puppies, or all the animals in a kennel may become affected at one time. It occurs in districts as an enzoötic. In cities it is more prevalent than in the open country. The season of the year has some influence on its prevalency and distribution, the fall and winter months usually being most productive of the disease. Highly bred animals are more commonly affected than those bred by natural selection.

Pathology.—Owing to the variety of forms of distemper in dogs the lesions found on examination are of many kinds, varying with the complications due to secondary infection. In peracute and acute cases there will be effusions of fluid from the serous membranes particularly in the pericardial sac, the thoracic and abdominal cavities. Small hemorrhages are observed in some of the organs (heart, liver and kidneys). In most cases of distemper the lungs will be affected, either as a capillary bronchitis, congestion or bronchopneumonia. The pleura is usually congested and sometimes covered with fibrinous deposits.

The intestinal tract shows marked changes, in most cases a catarrhal inflammation, which may be primarily in the stomach, or involving the entire tract. The glands in the mucosa are swollen. Erosions and ulcerations are frequently noted in the subacute or chronic forms. The lymph glands of the mesentery are enlarged and edematous. The liver is usually congested, or inflamed, frequently showing degenerative changes. The kidneys are enlarged, the capsule easily removed and the cortex markedly changed.

The central nervous system is often involved and there will be found congestion of the membranes and the cortex of the brain. Small hemorrhages will be observed in some cases. Other pathological changes of a minor character are noted, such as conjunctivitis, keratitis and more rarely panophthalmitis. Pustules in the skin are common.

Symptoms.—There is quite a variation in the symptomatology depending upon the form which the disease takes. The most prominent manifestations are those of an infectious catarrh, involving the membranes of the eye, the respiratory and digestive systems. The catarrhal symptoms are often complicated with those of severe disturbance of the brain and cord, pustular eruptions on the skin, and very frequently bronchopneumonia. For clearness in the description of the symptoms it is best to consider them under the following headings, depending upon the part affected:

1. *Initial Symptoms.*—The period of incubation is usually from three to five days. This period will vary considerably, depending upon various factors. Some few cases have been known to develop the disease in two to three days, while in others it required two to three weeks. The peracute type of distemper is ushered in by marked constitutional disturbances, such as great depression, fatigue, total loss of appetite, a very high temperature (106° to 107° F.) which in the course of several hours drops to normal, and later to subnormal. This form of the disease takes a very rapid course, the animal soon passing into a comatose state.

The acute form usually begins with a rather high temperature (103° to 106° F.) and remains elevated for several days or weeks. Some cases show a marked variation in temperature, beginning with a high temperature which in a few days drops to normal or in some cases subnormal where it remains until either recovery or death takes place. In some cases due to complications the fever is remittent. The owner will notice in the inception of the disease a change in the disposition of the animal. Instead of being lively it will be stupid, does not answer the call or obey commands given it. The hair coat becomes rough, quickly loses its gloss and the animal in general shows a dejected appearance. On examination of the nose, it will be found hot and dry; the mucosa becoming irritated induces rather violent sneezing. After one or more days more pronounced symptoms make their appearance.

2. *Symptoms Shown by the Eyes.*—In a large number of cases conjunctivitis is a prominent symptom. In the early stages it begins as a serous conjunctivitis, which soon becomes purulent from secondary infection. The discharge from the eyes consists of a thick mucus, or whitish or yellowish pus. This discharge is usually found collecting chiefly at the inner canthus of the eye, soiling the edges of the eyelids, or from the exudate drying, crusts form causing the eyelids to adhere. Usually in a few days lesions and ulcers appear on the cornea as a result of the irritant exudate, the patient rubbing its eyes or pawing them with the forefeet, or by the swelling which interferes with local nutrition. These ulcers are usually small, pin-point, funnel-shaped and extend downward in a straight direction; their base usually covered with a pus-like material. They heal by a proliferation of vessels from the edges of the cornea. In some cases the ulceration leads to partial perforation of the cornea, with a protrusion of Descemet's membrane, prolapsus of the iris (staphyloma). The resulting cicatrization causes permanent white spots on the cornea (leukoma). In other cases the entire cornea becomes opaque (parenchymatous keratitis) which gives the eyes the appearance of ground glass. Rarely does the entire eyeball become inflamed (panophthalmitis). Opacity of the cornea in a number of cases remains for weeks and even months.

3. *Symptoms Shown by the Digestive Tract.*—Vomiting is an early symptom in a large number of cases. The vomitus often consists of particles of food, frothy mucus stained with bile in cases where the vomiting is persistent. The mucous membrane of the mouth is hot, dry and congested. The animal drinks freely indicating the involvement of the mucosa of the stomach and bowels. Constipation is invariably the rule during the early stages of the disease, followed by diarrhea in the course of a day or so. The feces in the latter case are very fetid, often shiny, frothy and even bloody indicating hemorrhagic intestinal catarrh. The intensity of the gastro-intestinal symptoms varies from mild catarrh to a severe hemorrhagic gastro-enteritis. Symptoms of icterus are present in some cases due to the catarrhal duodenitis (catarrhal icterus).

4. *Symptoms in the Respiratory Tract.*—During the early stages of the disease the nose becomes dry and hot. There is a nasal discharge which is at first serous but later thicker and mucopurulent in character. During the early stages there is much sneezing and sniffing due to the attending rhinitis. The dog shows much distress and makes frequent attempts to clear the nasal passages by sudden expiratory efforts, rubbing the nose against objects and clawing at the nasal openings with the forepaws. The discharge accumulates around the nasal openings in the form of crusts; when these are removed the skin and mucosa often show excoriations. In severe cases the discharge is often so copious that the nostrils will be found partially or completely occluded.

Catarrh of the larynx is nearly always associated with this condition and is manifested by a cough, which usually occurs in paroxysms; it is at first dry and harsh, and later becomes moist and considerable mucus is coughed up, which is immediately swallowed by the animal. These paroxysms of coughing frequently end in gagging and vomiting. The catarrhal inflammation spreads quite rapidly to the trachea and bronchi. The resulting bronchitis causes a cough, which is deep and explosive. The respirations are accelerated. Auscultation reveals coarse, sharp vesicular

murmurs, and rhonchi. As the inflammation proceeds it involves the bronchioli (capillary bronchitis) which produces increased, labored respirations. At this stage there is usually a feeble harassing cough, most noticeable when the dog is made to move, or if the thorax is manipulated. The auscultatory sounds become increased, and there will be noted dry or moist crackling, or fine râles. In very weak, or young dogs, in which the exudation accumulates in the bronchioles, it is very sure to produce a bronchopneumonia on account of the secretions being drawn into the alveoli. The resulting pneumonia will be recognized by: (a) the great increase in the temperature; (b) the excessive dyspnea (inflation of cheeks at each expiration); (c) the sitting posture of animals with elbows spread apart to facilitate respiration; (d) irregular vesicular murmur; (e) irregular dulness and tympany on percussion; (f) the bronchial breathing which will be audible. The cough at this stage becomes very dull and weak. The nasal discharge becomes very fetid, and often has a greenish cast. During the last stages as the heart becomes weak, symptoms of edema of the lungs appear in the form of severe dyspnea, and bubbling rhonchi.

5. *Symptoms Shown by the Nervous System.*—This disease in practically all cases is accompanied by some nervous phenomena. It often begins, especially in weak individuals, with marked dulness and depression. These symptoms may be all that the animal will show. However, in a great many cases, the nervous symptoms develop early in the course of the disease, and are manifested by excitement, restlessness, yelping cries, even simulating some of the symptoms of furious rabies. In many instances tremors of muscles, tonic and clonic spasms, which may involve certain groups of muscles or the entire muscular system are observed. Local spasms and twitchings of the muscles are frequently observed involving the muscles of the face, and the region of the head and neck. The masseter muscles are frequently affected, resulting in chattering teeth and foaming at the mouth. Spasms of the muscles of the neck and limbs cause regular or irregular movement of the head or limbs. These movements may be present constantly or periodically. Convulsive contractions of certain groups of muscles are frequently observed, in which the animal at first becomes restless, excited, runs aimlessly about, is suddenly seized by tonic and clonic spasms, the head and neck usually backward, falls down as if from epilepsy, barks, cries and becomes unconscious with relaxation of the sphincter muscles. In some cases the animal will die during these convulsions; in others there is a gradual return to consciousness and in one or two minutes the animal is able to rise. Some cases pass into a long-continued state of coma. These convulsive seizures may become less frequent, and entirely disappear; or they may terminate in partial or complete paralysis. Paralysis is a very common sequel to this disease. It very rarely begins at the onset of the disease, but appears in most cases during the latter period. The paralysis may be confined to certain groups of muscles, in fact the posterior limbs are most often affected. The paralysis of the sphincter muscles is a very frequent sequel. Some cases begin with a paralysis of the posterior limbs, and result subsequently in complete recovery, while others show a progressive ascending paralysis, resulting in death from general paralysis. Various paralytic complications are often observed following the nervous form of distemper, such as deafness, amaurosis, hemiplegia laryngis, aphasia, loss of sense of smell, hydrocephalus, etc.

6. *Symptoms Shown by the Skin.*—In a large number of cases there will be noted a characteristic pustular exanthema. Small, red spots appear along on the abdomen, on the inner surface of the thighs, occasionally on the skin of the face, around the eyes and on the internal surface of the external ear. In twenty-four to thirty-six hours these red spots are transformed into miliary nodules, each surrounded by a red ring. These nodules change very rapidly into vesicles which become infected to form pustules. The pustules vary but are usually the size of a pea. They dry up either into a yellow, brown crust, or rupture and leave reddened, moist places to become covered later by a scab. When the pustular eruption becomes extensive the body gives off a peculiar, offensive, sweetish odor. Healing of the pustules takes place usually in about six to eight days, leaving bright pigmented, reddish spots, which remain for several weeks. In some cases the pustular form of distemper may spread, the pustules become confluent, forming a scabby eczema, which may be localized around the eyes, over the abdomen, or thighs, or it may be general over the entire body. Complications, such as septicemia and septicopyemia develop occasionally from this form of the disease. When the pustular eruption forms around the margin of the lip, it often spreads rapidly to the mucosa producing a severe gangrenous stomatitis. Involvement of the external ear in the form of an otitis is observed in a large number of cases. This is characterized by a thin fluid secretion, which accumulates on the surface of the ear, dries and forms a yellowish-brown crust or scales.

7. *General Symptoms.*—The initial high temperature is usually followed by a remittent or subnormal temperature. Some cases do not show much abnormality in temperature. Normal temperature in this disease, when other marked symptoms are present, does not always indicate a favorable termination. As the disease progresses the animal becomes emaciated, weak, and the action of the heart is more or less disturbed, depending upon the severity of the case. The mucous membranes are pale, the patient becomes very weak, staggers or retains a recumbent position.

Diagnosis.—During the early stages of distemper it presents some difficulty. It becomes necessary to decide whether we have distemper to deal with, or the beginning of some other condition, such as catarrhal inflammation of the eyes, nose, lungs, stomach or bowels. An accurate diagnosis cannot always be made during the early stages of the disease. Just as soon, however, as there appear symptoms of general depression, high temperature, the implication of several organs, especially in a young dog, distemper should be suspected. Should skin pustules be present they will assist materially in making the diagnosis.

nervous form of distemper are distinguished from those of epilepsy by the acute character, occurring at frequent intervals, and the local muscular twitchings, which occur even between the convulsive attacks.

Prognosis.—The prognosis is not favorable, even in the milder forms of the disease. Owing to the variety of forms the disease assumes, and the frequent complications the mortality is high, amounting to approximately 50 per cent. The prognosis depends to a certain extent upon the type of the disease, and whether or not the animal is strong and vigorous. The purely exanthematous form is most favorable. If the disease confines itself to this form the majority of the cases will completely recover in two to three weeks.

The catarrhal forms, involving the respiratory or digestive systems, are less favorable owing to serious complications which attend them.

The highest mortality occurs when the nervous system is involved. When severe nervous phenomena are present the prognosis is bad, only a small per cent recovering. Where there is a continuous, high temperature the prognosis is not favorable as there is danger of heart complications. A rapid fall in temperature to below normal is also a grave sign; in most cases it indicates the approach of death.

Treatment.—*Dietetic.*—It is very essential in distemper to supply the patient with easily digested, nourishing food. Perhaps the best food is raw meat chopped fine, or scraped into a pulp. Patients will be tempted by this food when they will not eat anything else. In cases where the appetite is lost, and in order to maintain the animal's strength, beef broth is most excellent. This may be given with warm milk, or milk with an egg beaten up in it. Other foodstuffs may be given, depending upon the progress of the case, and the needs of the patient. In the digestive form of the disease only small amounts of liquid foods should be given *via* the mouth. Rectal feeding with warm milk and meat broth is recommended in these cases.

Hygienic.—The animal must be well protected from exposure to extremes in temperature, or cold draughts of air. They should be placed in a clean, moderately warm well-ventilated room. The bedding should be kept clean at all times. Supply plenty of fresh water.

Medical.—Owing to the various complications the medical treatment must be essentially symptomatic. During the early stage of the disease calomel (0.075 to 0.1) is recommended as a purgative and bowel disinfectant. This dose may be repeated in twenty-four hours if necessary. To overcome the general depression, which is an early symptom, nerve stimulants, alcohol, aromatic spirits of ammonia, tincture of nux vomica (0.4 to 0.7), anyone of which should be given well diluted, and repeated as the case demands. As an abortive treatment subcutaneous injections of trichloride of iodine (three or four times daily, 2 to 4 cc. of a solution of 1 to 1000) have been used with very good results. This treatment when given early in the course of the disease has a very beneficial effect in regulating the temperature. The patients seem brighter, and the catarrhal symptoms diminished. The injections should be made at different points owing to the danger of skin necrosis. Further medical treatment will vary depending upon the part affected.

(a) When the disease involves the eyes, they should be washed with an antiseptic once or twice daily, boric acid (2 per cent), creolin (1.5 per

cent), to prevent undue injury to the cornea and other structures from the infection. In obstinate cases with excessive pus formation and discharge, silver nitrate solution (0.5 to 1 per cent) has been found very efficacious. When there is extensive parenchymatous keratitis a solution of stovaine (1 to 2 per cent) is useful to prevent irritation and subsequent injury to the eyes from rubbing them against objects, or with the paws. Opacities of the cornea when of some standing may be treated with a silver nitrate solution (2 per cent), followed by a normal salt solution as a wash, or succus eineraria maritima compositus (0.4 to 0.7) dropped into the eye daily. This latter preparation has proved to be of great value in the eye complications of distemper.

(b) The respiratory system should be treated by removing the secretions from the nasal openings, spraying the nasal passages with ereolin (2 per cent), or silver nitrate solution (0.25 per cent). Warm vapors, such as steam, or solutions containing alkalies (bicarbonate of sodium) given as inhalations are highly recommended. When there is a painful, dry, harsh cough the following formula is very beneficial:

R—Morphini sulfatis	0.15
Aqua amygdalæ amaræ	12.00
Aqua dest.	150.00
Misce et fiat solutio.	
Sig.—Give teaspoonful once or twice daily.	

In the presence of profuse secretions, sedatives are contraindicated. Instead ammonium chloride (0.1 to 0.5) is given as an expectorant twice daily to dissolve the mucus and other secretions. If symptoms of pneumonia are present, counterirritation to the thoracic walls with oil of mustard and glycerin (1 to 20). Heart stimulants are also advised. (See Treatment of Bronchopneumonia.)

(c) The digestive complications are treated according to the conditions found. If the animal is constipated it should be relieved by the administration of a purgative; if severe diarrhea is present the irritating bowel contents are first removed by a laxative followed by astringents and sedatives. The following formula will be found beneficial in the latter condition:

electricity is highly recommended, also strychnine (0.001) once or twice daily. Subcutaneous injections of veratrine (0.01 to 0.05) are sometimes used.

(f) The temperature in this disease is rarely treated, and only in exceptional cases where a very high temperature remains for several days and threatens to become dangerous to the heart, would it be advisable to use antipyretics. Phenacetine, acetanilide (0.25 to 0.5) may be used for this purpose.

(g) In the skin form, when pustules are present, they should be opened, and washed with creolin (2 per cent). For the exanthema the skin should be washed with an antiseptic soap (germicide, or tar soap), dried, and a drying powder or zinc oxide ointment applied. The latter is preferable.

Sera.—This disease has been treated quite extensively during the past with homologous serum. Good results have been obtained by its use by some, others have reported less favorably. Large doses in the early stages seem to give the best results. In the later stages anti-mixed infection serum (canine) is indicated.

Prevention.—Animals with distemper should be isolated and kept from healthy young dogs. Thorough disinfection of all utensils, bedding, rooms, etc., should be attended to promptly.

Preventive treatment (Laidlaw-Dunkin) has proved of value in a large number of cases and is highly recommended. Homologous serum may be used under certain conditions in an attempt to produce passive immunity. Distemperoid virus is now being used as a preventive treatment.

PIROPLASMOSIS OF THE DOG

Infectious Jaundice. Babesiosis Biliary Fever. Malignant Jaundice

Definition.—A malignant or infectious disease of the dog produced by the *Piroplasma canis* or *Piroplasma commune*.

Etiology.—Piroplasmosis of the dog has been reported in several different countries. It is produced by two species of *Piroplasma* or *Babesia*: *Piroplasma canis* (*Babesia canis*) and *Piroplasma commune*. Morphologically these parasites are identical with *Piroplasma bigeminum*. The *Piroplasma canis* is 2 to 4 microns in diameter, the free organisms spherical, and those contained within the corpuscles are pear-shaped or contain many angles. Multiplication is by direct division. The *Piroplasma commune* is similar, round or pear-shaped. The round type is 1 to 1.5 microns, and the pear-shaped 1.5 to 2.5 microns in diameter. The former is not transmissible to any other animal while the latter has been transmitted to the guinea-pig and cat.

Dogs become infected from ticks and fleas (*Ixodes ricinus*, *Rhipicephalus sanguineus*, *Dermacentor variabilis*, *Dermacentor andersoni*, *Hemaphysalis leachi*, *Ctenocephalides canis*), which have been found to be common carriers of the disease. Young animals (puppies) are most susceptible and often an entire litter will develop the disease. Older animals are partially or completely immune. The disease may be readily transmitted by injecting young animals with virulent blood. The initial symptoms develop in two to three days. Natural infection takes place from animals coming in contact with fleas or ticks infested with the piroplasm. The period of incubation from natural infection is from seven to ten days.

Pathology.—In the acute form the disease process is often so rapid that but little will be found on postmortem examination. The liver is found congested, the bile of dark color and thick. The spleen is enlarged often two or three times its normal size; the color is dark, the borders rounded. The kidneys are congested, and small hemorrhages are noted on the surface. The heart muscle is pale, and small petechiæ and ecchymoses are observed on the endo- and epicardium. The lungs are usually edematous, and ecchymoses occur on the membranes. The bladder contains a reddish-brown colored urine, especially in the very acute form of the disease. The skin and mucous membranes are greenish in color, which in some cases may be absent, the membranes very pale and anemic. In the chronic form the postmortem lesions are those of an anemia, with a paleness of all the tissues and organs. The liver is found intensely congested, the bile of a syrupy consistency and very dark in color. The blood from the spleen will contain large numbers of the parasites. The kidneys, heart and lungs are congested and show numerous small hemorrhages on their surfaces. The marrow of the bones is intensely congested, and of a dark reddish color. In the chronic form icteric symptoms are also observed. The blood has a thin, watery appearance, the serum practically colorless.

the red and white corpuscles, and the presence of the specific parasite. Sometimes it is difficult to find the parasite from a clinical case under the microscope. In such cases it is of advantage to confirm the diagnosis by inoculating a young puppy with some of the blood of the affected animal. The virulent blood should be injected into the circulation to obtain the most accurate and rapid results.

Prognosis.—In the acute form, the prognosis is not very favorable, the animals grow weak rapidly, and die from exhaustion in from three to six days. In the chronic form recovery often takes place after several weeks.

Treatment.—In the acute form, treatment should be applied at once. Trypan blue has given excellent results in many cases. It is administered, for the dog, in a 1 to 2 per cent fresh, sterile, aqueous solution. The solution is injected intravenously under aseptic conditions, using from 5 to 25 cc. amounts, depending upon the size and condition of the patient. To avoid shock administer solution of trypan blue slowly and at body temperature. The treatment may be repeated in twenty-four hours if the desired result has not been obtained. Some discoloration of the mucous membranes follows its application. When there is extreme weakness and subnormal temperature stimulants, such as strychnine sulfate (0.001 subcutaneously), or diffusible stimulants should be given as often as necessary to keep up the circulation and general condition of the animal. Quinine (0.3 to 1.) two or three times daily has been highly recommended.

The treatment in the chronic form is very similar. Plenty of good nutritious food such as milk, eggs, ground meat, etc., should be given to conserve the strength of the patient.

TYPHUS OF DOGS

Canine Typhus—Hemorrhagic Gastro-enteritis—Dog Plague—Black Tongue

Definition.—An acute disease characterized by a severe gastro-enteritis, stomatitis, and in some cases severe nervous symptoms.

Occurrence.—During the past few years this disease has appeared in various sections of the United States, producing extensive losses, particularly in old dogs. In some districts it has made the breeding and handling of dogs prohibitive. The disease follows in the wake of dog shows and such exhibitions.

Etiology.—The nature of the disease indicates that it may be produced by some specific infection. Up to the present time no such agent has been isolated. Experimental inoculations with various organisms, which have been isolated, have not proved that any of them are constant in reproducing the disease in healthy animals. In a number of outbreaks in this country, old dogs were as commonly affected as young. Further, dogs which have had distemper in severe form come down with this disease. The breed, or sex of the animal seems to have nothing to do with its susceptibility. Other diseases, such as distemper, may be predisposing factors.

Pathology.—The autopsy in this disease presents a rather constant picture. The digestive tract is mainly involved. The mucosa of the mouth is often inflamed; ulcers are found in a number of cases, particularly noticeable along the margin of the gums. In some cases extensive necrosis of the buccal mucosa is found. The tongue is frequently thickened, swollen and

nearly always diminished or suppressed. Rapid dehydration of the body, through lack of absorption of fluids, vomiting, salivation and urination, quickly takes place. Nervous symptoms of excitement and convulsions are occasionally observed, but in most cases somnolence, lassitude and coma are characteristic. Modification of these symptoms may be found, depending upon the severity of the condition.

Diagnosis.—There are some very characteristic symptoms which materially assist in establishing a diagnosis—the sudden and persistent vomiting, the inappetence, the presence of ulcerations on the mucous membranes of the mouth, the great depression, the character of the vomitus, the characteristic injection of the conjunctiva, and the normal or subnormal temperature. A differential diagnosis must be made from canine distemper. In canine distemper there are invariably present the characteristic catarrhal symptoms involving the eyes and nasal passages. The period of incubation is usually longer in distemper, five to nine days. Further, distemper is more common in young animals, and the course of the disease is acute. This disease must also be differentiated from ptomaine and other poisonings. In some cases this is quite difficult, owing to the close similarity of the symptoms, gastro-enteritis appearing in both conditions. The necrosis of the membranes and ulcers are absent in ptomaine poisoning, and in the majority of mineral poisonings. The development of the disease is different from ptomaine, or other poisonings. Canine typhus usually appears as an epizootic which would assist in establishing a diagnosis. Differentiation between this disease and ulcerative stomatitis should present no great difficulties. The absence of the general depression, vomiting and gastro-enteritis in ulcerative stomatitis is indicative. Scorbutus develops slowly, and is attended by neither vomiting nor general symptoms.

Course.—The average duration of the disease is four to six days; in milder cases often twelve to fourteen days. A few cases run a much more rapid course followed by death in one to three days.

Prognosis.—The prognosis is usually favorable, but in severe cases it is often fatal.

vomiting, sedatives are useful. Hot packs applied to the epigastrium are beneficial. Rectal injections of warm water, or even washing the entire alimentary tract with sodium bicarbonate solution (2 per cent) when diarrhea is present, will remove irritating material. In obstipation, warm rectal infusions may be used in preference to laxatives or purgatives. Ichthargan has been highly recommended for typhus in the following formula:

P—Ichthargan,	20
Gummi arabicæ aa	60
Aquæ chloroformi	
Misce et fiat mist.	
Sig.—Give teaspoonful every three or four hours.	

Stimulants (atropine sulfate, 0.075 to 0.15 subcutaneously) to sustain the heart action and to overcome the general depression would be advised. The mucous membrane of the mouth should be washed at least twice daily with boric acid solution (2 per cent); potassium permanganate (0.25 per cent), or therapogen (2 per cent). The animal should be well protected in a quiet place. In a great many cases the treatment has proved unsatisfactory owing to the peracute course it often assumes. When severe anemia is in evidence a blood transfusion may be followed by marked improvement.

same manner as the hemorrhagic type and also through the eating of carcasses of infected rats, or food and water contaminated with the urine of infected rats, as it is well known that wild rats are vectors of *Leptospira icterohemorrhagiae*. *Leptospira canicola*, however, has never been found in rats. What part recovered animals play as carriers and shedders of the infection is not definitely known.

The case mortality of the icteric type may vary from 50 to close to 100 per cent, while in the hemorrhagic type it is estimated at approximately 50 per cent.

Symptoms.—The symptoms of leptospirosis vary with the type. In the hemorrhagic type the onset is sudden; weakness and depression are marked, the animal refuses to eat, the temperature may be elevated to 105° or higher, and the conjunctiva is congested or of a muddy appearance. The disease progresses rapidly, weakness and depression being accentuated. There may be lameness in one or more legs or a partial paralysis of the posterior extremities. There is a marked dehydration as evidenced by increased thirst and rapid loss of weight. Frequently, persistent vomiting occurs and the vomitus is sometimes tinged with blood. The temperature soon falls and may become subnormal; in fact, when the veterinarian is first presented with the case the temperature is usually either normal or subnormal. Breathing becomes labored, with or without a persistent hacking cough. The buccal membranes usually become hemorrhagic and later ulcerative or necrotic. There may be a recession of the eyeballs into their sockets, and a mucopurulent discharge and this may be followed by yellowish or brownish crust formation. Mucopurulent discharge is frequently observed from the nostrils. Animals are first constipated; later the stools may be liquid and tinged with blood. Albuminuria will be noted in practically all cases. There are symptoms of a pronounced gastro-enteritis; the abdomen is sensitive to palpation. A characteristic fetid odor is usually present. The animal may develop convulsions, followed by coma and death. The course is usually rapid, death occurring in from three to ten days following the appearance of the first symptoms.

The icteric type of the disease presents the same general symptoms and, in addition, a pronounced general icterus; the skin showing a yellowish to orange discoloration. The evidence of gastro-intestinal disturbance is less marked than in the hemorrhagic type.

Pathology.—The outstanding anatomical change in the hemorrhagic type of leptospirosis is a severe hemorrhagic gastro-enteritis. All tissues show evidence of dehydration. Petechial and ecchymotic hemorrhages are scattered over the pleura and peritoneum. The lymph glands are swollen and edematous. The spleen is smaller than normal and the capsule is wrinkled. The liver is mottled and congested, and the kidneys may be slightly enlarged and also congested. The respiratory tract is usually congested. The lungs may be edematous and spotted with the diffuse hemorrhages and pneumonic areas. The mucous membranes of the mouth and gums are dry, may be covered with diphtheritic membranes and present ulcers or areas of necrosis.

Diagnosis.—Through careful study of the case history, the symptoms, and the incidence of the disease in the surrounding area leptospirosis may be diagnosed with a reasonable degree of accuracy. In those areas where leptospirosis has not yet become endemic, it is advisable to have the tentative diagnosis confirmed by laboratory examination. The microscopic agglutination test is the most satisfactory and rapid laboratory procedure that can be employed. The complexity of this test, however, precludes its use in the field. Various dilutions of serum are added to formal-killed antigens, the mixtures are incubated for four hours and readings made by dark field. Positive reactions in dilutions as high as 1 to 100,000 or more may be obtained.

Control.—The control of leptospirosis, especially in kennels and hospitals, is sometimes a difficult problem. From the present knowledge of the method of spread, rigid sanitary measures are of foremost importance. Persistence in a kennel in spite of rigid sanitary measures is suggestive of the presence of carriers and shedders of infection. Many drugs and combinations of drugs have been tried, but medicinal treatments have for the most part been disappointing. The handling of individual cases is largely a matter of good nursing and symptomatic treatment. In Japan, England and Continental Europe, leptospirosis of the icterohemorrhagic type (Weil's disease) is quite common in man. Human infections with the canicola type, also, have been reported in Continental Europe and several cases have been recognized in this country. With the knowledge that leptospirosis is communicable to man, the veterinarian will properly safeguard the health of not only his hospital attendants and himself, but will advise the owners of dogs known to be affected with this disease.

Antileptospira serum (Equine origin) has been used with encouraging results as a curative agent. To satisfactorily treat a diseased animal with serum, every effort must be made to treat the diseased animal before the disease has progressed to the stage of extensive organ and tissue damage. Serum can be administered as a prophylactic measure. Here, too, satisfactory results may be expected.

The serum is usually administered subcutaneously at the rate of 0.5 cc. per pound body weight to exposed animals and given at the rate of 1 cc. or more per pound body weight to animals showing symptoms. The repetition of the dose is dependent on the response of the animal being treated and the severity of symptoms.

ones most liable to be affected. Dogs are not very susceptible to the infection, and take it in a mild form. The principal symptoms are vesicles on the mucous membranes of the lips, sometimes forming ulcers, which penetrate more or less deeply into the tissues. Sometimes the feet become involved when there will appear a vesicular exanthema on the balls of the feet and between the toes. The feet will be swollen, hot and sensitive, and the patient very lame. General symptoms, such as elevation of temperature, diarrhea, loss of appetite and vomiting have been observed.

TULAREMIA

Wild rabbits, hares, ground squirrels, and perhaps certain rodents constitute the greatest reservoir of infection for other animals and man. Other animals such as the dog, cat, sheep, etc., contract the disease by their contact with those animals enumerated above. Since this disease is of primary importance to the rabbit and other wild animals the reader is referred to other works for the discussion of this disease.

INFECTIOUS GASTRO-ENTERITIS OF CATS

Hemorrhagic Enteritis; Feline Infectious Enteritis; Feline Distemper; Feline Panleucopenia

Definition.—This is an acute, contagious disease of cats occurring in the form of an epizootic and characterized by high temperature, extreme depression and diarrhea.

Occurrence.—Evidence seems to point to the periodic occurrence of this disease in all sections of the United States and in many foreign countries. It affects young cats most commonly although those of mature years are susceptible.

Etiology.—Investigational work of the past several years seems to have conclusively proven the cause to be a filterable virus. The various microorganisms that have been isolated from the organs of affected animals will not produce the disease and must therefore be considered as secondary invaders.

Natural Infection.—This may be by means of direct or indirect contact. The virus is present in the saliva, nasal secretions, urine and feces. The incubation period is variable, being between six and fourteen days.

Symptoms.—The development of the symptoms is very rapid. The disease is ushered in by a sudden suppression of the appetite, vomiting, retching, marked depression and general weakness. The animal shows a tendency to seek dark places and lies stretched out on its abdomen. The temperature rises rapidly after the onset reaching 103° to 106° F. in twelve to twenty-four hours. The temperature remains high during the early part of the disease, but later becomes normal or subnormal. Emaciation comes on rapidly, a profuse diarrhea is present, the feces having a characteristic fetid odor. As the disease progresses the animal becomes weak, eyes retracted and staring. The fur becomes rough and soiled. The skin quickly loses its normal tone indicating dehydration. Anemia is usually present. Many individuals mew plaintively, especially when handled. In three to four days coma develops, and death follows in the course of a few hours. The course is very rapid in acute cases. Some few cases assume a subacute form, and the symptoms are milder but progressive.

Pathology.—A more or less severe gastro-enteritis hæmorrhagica is typical of this disease. The entire mucosa of the digestive tract is highly congested and dotted over the surface with petechiæ and numerous patches of ecchymoses. The membrane is covered with a catarrhal exudate which in the majority of cases contains some blood. The serous covering of the intestines shows marked congestion, but no petechiæ. The presence of gas in the stomach and bowels is quite constant. The stomach particularly is nearly always found distended. The heart muscle, liver and kidneys show signs of rapid degeneration. The gall-bladder is greatly distended, and the bile is dark colored, thick and tenacious. The lungs may show congestion, and in subacute attacks pneumonic areas. Other cases may not show changes in the lungs.

Diagnosis.—The disease is recognized by its contagious character, its rapid, severe course, high temperature and the profuse diarrhea. Pto-maines or mineral poisons will produce similar symptoms, however, the contagious character and the investigation of the food supply, history of poisoning, etc., will serve to make clear the differentiation. Parasites of the intestines and hair balls of the stomach may produce much the same symptoms and should be taken into consideration in making the diagnosis. It is very important to be able to make an accurate diagnosis for the protection of other animals.

Prognosis.—The prognosis is unfavorable. The course is usually very rapid, frequently not being more than three or four days. Even in the early period of the disease, and in the apparently mild cases, it should be looked upon as a very serious condition. The mortality is very high, from 80 to 90 per cent of the cases terminating fatally.

Treatment.—Preventive treatment by the use of tissue vaccines, as well as the use of the virus and anti-serum has met with some favorable results. At present there is no very reliable form of treatment. Symptomatic treatment is of course indicated.

Strict isolation and sanitation is very important and should always be practised. The use of homologous anti-serum intravenously or subcutaneously at daily intervals should be continued as long as necessary.

The subcutaneous or intraperitoneal injection of a normal saline solution may prevent excessive dehydration.

CHAPTER II

INFECTIOUS DISEASES WITH SPECIAL INVOLVEMENT OF THE NERVOUS SYSTEM

RABIES

Hydrophobia—Lyssa

Definition.—An acute infectious disease, fatal in the majority of cases, and characterized clinically by disturbance of consciousness, marked irritability and later by symptoms of paralysis.

Occurrence.—Rabies is one of the oldest known diseases and has been observed in all countries. It is most commonly noted in dogs, cats, wolves and foxes. Other animals are less commonly affected. It is estimated that about 90 per cent of the cases of rabies occur in dogs. The disease often occurs enzoötically, which may be at any season of the year. The larger number of outbreaks in the United States has been in the colder months of the year. Outbreaks are naturally more frequent where dogs congregate, and in communities or cities where there are no protective regulations. In some countries and districts rabies is decreasing, due to proper police regulations which restrict the number of dogs running at large.

Etiology.—Rabies is produced by an ultramicroscopic virus. This virus is found to be the most virulent when taken from the central nervous system (brain and cord), less so from the peripheral nerves, salivary and other glands and their secretions. The infection does not seem to be present in the blood of affected animals. The infectious agent is fixed, obligatory and non-volatile.

Pathogenesis.—The virus enters the system by the bite of a rabid animal, such as a dog, cat, fox, or rabbit.

spinal cord. After the virus reaches the central nervous system to produce irritation on certain groups of cells, it is then centrifugally distributed to different parts of the body. It reaches the salivary glands, which favors the development of the virus, increasing the secretion of the glands, and then is further disseminated through the saliva. The period of incubation of rabies is quite variable. The virus after being introduced into a wound may remain in a dormant state for some time before reaching the central nervous system. The variation in susceptibility of animals, in the virulency of the infection, and the method of the dissemination of the virus in the body, naturally tend to make the period of incubation rather long. Three to seven weeks is the usual time for development in dogs. However, some cases develop only after several months. The period of incubation



FIG. 36.—Rabies

on their summits. Hemorrhage sometimes occurs from the foreign material cutting or tearing the mucosa. The mucosa of the pharynx and larynx shows congestion and is covered with mucus. An acute catarrhal inflammation of the respiratory passages is frequently found. The brain and its coverings are often injected with small hemorrhages. No other lesions of any importance are observed.

Symptoms.—From a clinical standpoint it is necessary to divide rabies into two types, viz.: (1) furious rabies, and (2) dumb rabies. The different trains of symptoms depends entirely upon whether the brain or spinal cord is primarily involved. However, cases are observed occasionally where an animal affected with dumb rabies suddenly develops the furious type. The dumb or mute rabies seems to be the most common form in the United States.

1. **FURIOUS RABIES.**—In this form three stages of development are rather sharply defined: (a) melancholic or prodromic stage; (b) maniacal or irritative stage; (c) paralytic stage.

(a) *Stage of Melancholy.*—In the stage of melancholy or in the beginning of the disease, the first thing usually noted by the owner is the altered behavior of the animal. It becomes sullen, afraid, seeks dark places, is easily irritated, restless and obstinate (often does not obey its master). The patient is also inclined to hide itself, alternately gets up and lies down frequently, makes sudden, unusual movements, such as snapping or biting at imaginary objects, or barks suddenly without any apparent cause. During the early stage of the disease the appetite is not much changed, but later the manner of eating and the kind of food chosen are greatly modified. Dogs are inclined to eat indigestible objects, such as pieces of wood; eat their own feces and lap up their own urine, etc. A very noticeable symptom is the tendency to grasp objects as if to eat them, then suddenly let them fall from the mouth. Constipation is usually present in this stage. During the latter part of this stage the patient is excitable. The patient shows a marked change in disposition, snaps at objects, its master, other persons or other animals. This excitability is more noticeable toward strange persons or animals. Sometimes the patient manifests no change in disposition toward its master, familiar persons or animals. The excitability gradually, or very rapidly, increases. The nervous reflexes become sensitive and the patient is easily startled by sudden noises, touching objects or by strong light. The pupil of the eye dilates and the facial expression is changed. Dyspnea is prominent at times. The patient will often scratch or bite the place of infection, sometimes doing extensive injury to the area. The appetite is entirely suppressed but the animal seeks water and attempts to drink, but, on account of the beginning paralysis of the larynx and pharynx, does not succeed. The salivary secretion is increased, and saliva hangs from the mouth in long strands. This stage usually lasts from one to three days.

(b) *Stage of Irritation.*—In this stage the symptoms reach a higher degree of development. The excitement increases; hallucinations, which bring about violent fury or rage, are soon apparent. The voice of the animal changes decidedly from the normal. This is a very characteristic symptom of rabies, and no doubt results from the congestion and paralysis of the vocal cords. The owner's attention is always attracted by the unusual amount of barking and the change in the voice. At this stage they

become vicious, and if confined show a tendency to chew objects and to tear them to pieces. Rugs, carpets, or other objects with which they come in contact are torn and destroyed. At this time if they are not confined they will usually wander away from home, biting other animals or persons that happen to come in their path. Often during a short period of time they will travel long distances before returning, which they invariably do. Upon their return they show emaciation, exhaustion, often wounds from being bitten by other animals, and in general have a dejected appearance. The desire to bite objects and animals is quite characteristic of this stage. A rabid dog in this stage may inoculate a large number of animals unless confined. When confined in a cage or room they show at times intense fury and viciousness. If irritated, by placing a stick between the bars of the cage, the dog will attack it viciously, but shows the peculiar symptom of simply biting instead of holding on to the stick as non-rabid dogs ordinarily do. As this stage progresses the periods of fury become shorter, and soon marked depression is noted. Paralysis of some of the special nerves develops, shown by the increase in the change of the voice, which becomes a peculiar wail or howl, and the difficulty in swallowing. The eyes are congested, and also the mucous membranes of the mouth. This stage of fury lasts usually two to four days.

(c) *Paralytic Stage*.—The symptoms of paralysis become more pronounced, and the patient is less vicious. Complete loss of voice and the inability to swallow, with paralysis of the tongue and masseter muscles, are early symptoms of this stage. The mouth is held open, the dry tongue is protruded and completely paralyzed. The eyes are retracted, lose their expression and luster; the pupils become dilated, in some cases unequally. The animal shows marked general emaciation, the hair coat rough and there is much exhaustion. The general paralysis asserts itself, beginning in most cases at the tail and posterior limbs. The animal has difficulty in walking or standing; later there is complete paralysis of the posterior part of the body. The paralysis rapidly ascends to the foreparts and central nervous system, causing death in most cases on the fifth to eighth day of the attack. The temperature in rabies has not been recorded in many cases. During the early stages it is elevated to 104° to 106° F.; later becoming subnormal. Variations in the symptoms of furious rabies are observed, but most cases present a rather constant clinical picture.

The symptoms of furious rabies in cats are very similar to those of dogs. They often become very vicious, and bite and scratch everything with which they come in contact. The change of voice is also quite noticeable. The course of the disease is usually shorter, lasting from three to six days.

2. *DUMB RABIES*.—This form is characterized by a paralysis of the lower jaw, tongue, larynx and pharynx. This symptom develops early in the disease and is the most prominent one until general paralysis manifests itself. The owner is often led to suspect that the animal has a bone or some other object lodged between its teeth, or in its throat. All such cases should be looked upon with suspicion, and all precaution taken in making the examination. In the majority of cases no nervous or excitable symptoms are shown; the paralytic symptoms gradually becoming more pronounced until the animal succumbs to general paralysis. Cases are observed occasionally where symptoms of excitement develop during the course of the disease. One such case was observed in which the early

symptoms indicated dumb rabies but in twenty-four hours all the symptoms of the furious form had developed. Animals with this form of the disease usually seek dark, cool places and lie almost constantly.

There is the same peculiar expression from the eyes as in the other form. The patient often attempts drinking or eating which the paralysis prevents. There is usually no tendency to bite nor viciousness manifested.

Rabies in rabbits nearly always assumes the paralytic form.

Diagnosis.—In furious rabies the diagnosis does not present any great difficulty where the symptoms are pronounced and the animal observed through the different stages. The positive proof of a bite inflicted previously by another animal is of considerable importance in making the diagnosis. An accurate diagnosis is of great importance for two reasons, *viz.*: (a) in case human subjects are bitten, or in any way inoculated, it will give them an opportunity to receive the antirabic treatment early; and (b) to protect other animals and persons from becoming inoculated by quarantining and confining the animal. Under no circumstances should an animal showing symptoms of rabies, or suspected of having the disease, be killed. It should be put in quarantine and observed. It has been demonstrated that animals destroyed early in the disease often do not show positive findings on microscopic examination. The characteristic symptoms of irritation, tendency for biting, change of voice, paralysis, etc., generally show evidence enough to the experienced clinician to establish the diagnosis. The detection of Negri bodies on microscopic examination will make the diagnosis positive. In dumb rabies the diagnosis is made on the characteristic symptoms of paralysis of the lower jaw, the somnolence in most cases, the expression and the paralysis of other parts of the body in the course of two to four days. All cases showing the symptoms of the lower jaw hanging down should be diagnosed dumb rabies until ample proof is shown that it is some other condition. Microscopic examination of the brain should be made to establish the diagnosis as in furious rabies. Intracranial inoculations of rabbits and mice have been used extensively in making a positive diagnosis. This method requires from eight to fourteen to seventeen days. Inoculations of the virus in guinea-pigs have also been used extensively as a diagnostic measure.

Prognosis and Course.—The disease is fatal in practically all cases. The possibility of recovery in very mild cases cannot be denied. It has been estimated that only about 17 to 20 per cent of the animals bitten by known rabid animals develop rabies. This percentage is higher in dogs than in any other small animal. The course of the disease is quite constant in the different animals, although variations occur occasionally. Five to seven days is the usual course; it may be in exceptional cases as short as two days or as long as ten or eleven days. There is but little difference in the course of the two forms; usually dumb rabies runs a longer course than the furious type.

Differential Diagnosis.—There are quite a number of diseases in small animals which might be confused with rabies: (a) diseases of the brain, particularly inflammations involving the meninges and the cerebral substance itself. In these cases irritability and nervousness are present, but the tendency to bite, the aggressiveness, change in voice and development of the paralysis in the same way are absent. If there should be any doubt the animal must be confined and observed for a few days when the differen-

tiation will not be difficult. (b) Canine distemper (nervous form) sometimes stimulates rabies, but the history of the case, the other symptoms of distemper and the length of the course of the disease will reveal the difference. (c) Parasites in the intestinal tract often produce certain nervous phenomena, but of different development and type than rabies. Many of the characteristic symptoms of rabies are absent. (d) Other parasites (*Linguatula rhinaria*, *Diocetophyme renale*, *Spiroptera sanguinolenta*, *Otodectes cynotis*) may produce certain nervous symptoms, but careful examination and observation of the animal will readily distinguish the difference. (e) Foreign bodies lodged between the teeth, around the tongue or in the pharynx will induce salivation, hoarseness from the accompanying edema and cause the mouth to remain open. These cases should be examined very carefully to differentiate them from rabies. In most of these cases it is impossible to close the mouth, which is not true in rabies, and there are no general symptoms. (f) Trigeminal or facial paralysis is observed occasionally in the course of distemper, or as an independent condition. In these cases there are no other symptoms of paralysis, nor any general symptoms. The course is longer and the animal remains otherwise normal. (g) Epilepsy might be confused with rabies. But this condition comes on suddenly and lasts only a few minutes to disappear completely until the next attack. (h) Eclampsia is differentiated by its occurrence in bitches at or near the time of whelping, clonic spasms which affect the entire body and none of the other characteristic symptoms of rabies. (i) Infectious bulbar paralysis in which the symptoms are quite similar to rabies. It is distinguished from rabies by the absence of the furious attacks, viciousness and paralysis of the lower jaw and fracture involving the lower jaw. The blood and brain tissue are infectious and the saliva not. This disease develops suddenly and runs a more rapid course than rabies. Finally, there are a few conditions in which the animal will show more or less nervousness, but none of the other symptoms of rabies. Animal inoculation and the microscopic examination of the brain should be made in all cases of doubt.

positively exposed individuals. Owners whose dogs have received any form of preventive treatment should not be allowed to believe that such treatment affords absolute protection.

INFECTIOUS BULBAR PARALYSIS

Pseudorabies

Definition.—An infectious disease affecting dogs, cats, rats, horses and cattle resembling rabies in many respects.

Etiology.—This disease is produced by a specific virus, the nature of which has not been determined. All animals are susceptible to inoculations with the virus which is found in the blood, central nervous system, and in some of the other tissues. The saliva, bile and urine are free from the virus.

Pathogenicity.—Most animals are very susceptible to infection by inoculating them with only minute quantities of the blood, or central nerve tissues, from those affected with the disease. At the point of inoculation, the tissues become red and inflamed; later, necrotic. The inoculated wounds show intense irritation, and the animal bites and scratches the part almost continuously. Dogs and cats contract the disease readily after being fed on organs or tissues containing the virus.

Natural Infection.—This has not been definitely established, but probably in most cases is due to eating infected meats, or being inoculated by infected mice or rats.

Pathology.—No marked lesions are found in this disease, except at the point of inoculation. The meninges of the brain, and the brain substance, usually show hyperemia, and blood extravasations. When infection takes place in cats and dogs from eating infected meat, the stomach and small intestines are congested, and in some cases markedly inflamed. Hemorrhages under the mucosa, and frequently petechiæ on the serous membranes of the stomach and intestines are noted. No other lesions are found.

Symptoms.—The period of incubation varies from two to nine days. The onset of the disease is characterized in the dog and cat by a sudden change in disposition, tendency to seek dark, cool places, where the patient lies quietly or maintains a crouching attitude. They often cry or mew as if in severe pain. Vomiting is more or less persistent, there is complete loss of appetite, and marked salivation. Severe itching is manifested in most cases by the animal scratching and biting itself, sometimes so severely that the skin is entirely removed over the involved area, usually around the lips or face. In some few cases this symptom may be absent. As the disease progresses the animal shows more pain by howling, crying, or groaning. The muscles around the head and face often show marked twitching, which may be periodical or constant. The nervous system is affected as is shown by increased reflex excitability, paralysis of the pharynx and larynx, and increased muscular sensitiveness. There is marked dyspnea. The temperature is usually normal or subnormal; toward the end the subnormal temperature is very marked. The animal usually dies in about thirty-six to forty hours.

Diagnosis.—There might be some difficulty in establishing an accurate diagnosis. However, the symptoms, which are quite constant, and the rapid, fatal course, would assist.

Differential Diagnosis.—In the dog and cat it is necessary to distinguish this disease from rabies. The chief points of difference are the following: (a) rabies (furious) is characterized by symptoms of rage or fury, aggressiveness; in dumb rabies by paralysis of the lower jaw. Both are absent in bulbar paralysis. (b) The saliva in rabies is highly infectious while in this disease it is non-infectious. (c) The period of incubation is usually from two to nine days while in rabies, although variable, it is much longer. On account of its rapid course, it might easily be mistaken for some acute poisoning. Should the symptom of itching and irritation be absent a differentiation would be quite difficult. On such cases experimental inoculation with the blood of the affected animal into healthy ones will assist. Frequently, a number of animals in a neighborhood will become infected at the same time, the disease appearing in the form of an enzootic.

Prognosis.—Very unfavorable. The majority of cases die.

Treatment.—Treatment is unsatisfactory. Antiseptics for the digestive tract may be tried. Thorough disinfection is necessary in order to check the disease. All dead animals should be burned or buried in lime to destroy the virus.

TETANUS (LOCKJAW)

Definition.—An acute, infectious disease, characterized by involvement of the nervous system, resulting in spasmodic contractions of certain groups of muscles, or the entire musculature of the animal's body, without that consciousness is disturbed.

Occurrence.—Tetanus is of rare occurrence in small animals. It is observed occasionally in dogs. It is far more common in the large domesticated animals.

Etiology.—It is produced by a specific bacillus *Clostridium tetani*.

Natural Infection.—Infection takes place by the bacilli or spores gaining entrance to wounds in the skin or mucous membranes. The most common intermediate carrier of the infection is the soil or earth which comes in contact with the wounds. Rarely is the disease spread from one animal to another.

Pathology.—The postmortem is usually negative. The affected muscles are usually pale, or may show occasional hemorrhages. The condition of the blood indicates in most cases that death is due to suffocation. Other lesions are inconstant and of minor importance.

Differential Diagnosis.—(a) Differentiation must be made between tetanus and strychnine poisoning which show very similar symptoms. In strychnine poisoning the spasms develop more rapidly, and are of much greater severity and the membrana nictitans is not usually affected. The extremely increased reflex excitability in strychnine poisoning as compared to tetanus will also serve to differentiate them.



FIG. 37.—Tetanus.

(b) Tetanus may also be mistaken for cerebrospinal meningitis, but in the latter disease other symptoms, such as dulness and paralysis of certain cerebral nerves, are present which will assist in the diagnosis.

(c) Muscular rheumatism is differentiated by the absence of reflex excitability; the muscles are painful and swollen rather than contracted as in tetanus.

(d) There are quite a number of conditions (rabies, eclampsia, epilepsy, articular rheumatism, etc.) which show some symptoms of tetanus, but there are always other symptoms present which are sufficient for differentiation.

Prognosis.—The prognosis in dogs, providing the symptoms are localized, is quite favorable. Should the disease, however, become general it is unfavorable. The course in the dog is usually subacute or chronic.

Treatment.—*Dietetic.*—When trismus is present, preventing the animal from taking food, rectal feeding is recommended. Concentrated beef broth at body temperature is perhaps best. Two to four ounces should be given three to four times daily. During the later stages milk can be allowed as they will lap it in small quantities.

Medical.—Small and repeated doses of morphine sulfate (0.05 to 0.2) once or twice daily to control spasms of the muscles; or chloral hydrate administered per rectum (1 to 4 with acacia and glycerin), using 6.00 to

12.00 of the mixture once or twice daily. Subcutaneous injections of a diluted carbolic acid solution have been recommended, but are of doubtful value.

Serum.—Tetanus antitoxin has proved to be of greater value as a prophylactic than a curative treatment. Large doses might be used, 1500 units daily for three to four days.

Surgical.—In case a wound is found indicating the focus of infection, it should be thoroughly curetted and strong antiseptic solutions applied (mercuric chloride 1 to 1000; carbolic acid solution 5 per cent).

CHAPTER III

CHRONIC INFECTIOUS DISEASES

TUBERCULOSIS OF THE DOG AND CAT

Occurrence and Form.—Tuberculosis is not very often observed in dogs and cats. As the pulmonary form is most common, the infection is probably transmitted to the lungs on inhaled particles of dust. In some cases, primary involvement of the digestive tract is found, indicating that the germs were probably taken in with the food. Rarely do we find infection has taken place through any other channel.

Pathogenesis.—Most of the cases no doubt result from association with tubercular human beings, or contact with infected rooms, etc. It may also result from ingesting meat containing the bacilli.

Pathology.—Two distinct types are found on necropsy: (a) pulmonary-form, and (b) digestive form.

(a) In the pulmonary form the lungs show caseous foci, or small miliary nodules. A chronic, indurative bronchopneumonia or a chronic interstitial pneumonia is frequently found. Adhesions are common between the lungs and parietal pleura. Aside from these lesions there are very often present edema and emphysema of the lungs, bronchitis and bronchiectasis. The pleura often shows evidence of a serous or serofibrinous pleuritis with considerable fluid present in the thoracic cavity; or in other cases a dry, granular adhesive pleuritis in which the parietal and visceral pleura are adherent. Numerous small nodules are often found on the pleura. The bronchial lymph glands are more or less enlarged.

(b) The intestinal lesions are mainly in the mesenteric lymph glands, which are enlarged; the walls of the intestines show miliary tuberculosis particularly on the serous covering; the liver usually presents similar lesions. The spleen and kidneys often show miliary tuberculosis. The cadaver in general shows evidence of cachexia and emaciation.

Symptoms.—The disease usually runs a chronic course the symptoms developing gradually. General emaciation is apparent in spite of a fairly good appetite, the animals become easily exhausted, are dyspnoëic (lung form), and weak. After emaciation begins to be a prominent symptom, the form of the disease, whether pulmonary or intestinal, will assert itself. The pulmonary form is characterized by a short, dry cough, which later becomes more moist and is accompanied by a discharge of a mucopurulent secretion which in most cases is swallowed. The respirations grow labored; dry or moist râles are heard on auscultation. Percussion reveals areas of flatness, and usually hydrothorax. An atypical fever is present during the course of the disease. In the intestinal form the symptoms of chronic intestinal catarrh are most prominent with diarrhea during the latter stages. Rapid emaciation is generally followed by death in a short time.

Diagnosis.—As tuberculosis is not very common in dogs and cats, and the symptoms not particularly characteristic, a diagnosis is not often made during life. The history of the case and its chronicity might lead one to suspect it.

Prognosis.—Unfavorable.

Treatment.—In advanced cases no treatment should be attempted. During the early stages good nutritious food, and tonics are best. Inhalations of creolin vapor are recommendable.

GLANDERS

In dogs and cats glanders is not very common. It is occasionally observed among carnivora fed meat or organs from horses affected with glanders. In zoölogical gardens glanders may be enzoötic among meat-eating animals, especially when horse meat is fed. Glanders usually assumes an acute form in these animals. The early symptoms are those of an intense inflammation of the mucous membrane of the nasal passages, larynx, trachea, and the conjunctiva. In a short time (two to five days) appears a greenish-gray or blood-stained secretion from the eyes and nose. The respirations are labored on account of the intense congestion and swelling of the respiratory mucous membrane. The symptoms rapidly become aggravated, the tissues about the head become swollen, nodules appear at different points in the skin, which open and form irregular-shaped ulcers. Diarrhea is a prominent symptom. The animal becomes emaciated, and succumbs in the course of eight to fourteen days. When such symptoms occur, the animal should be isolated so that further spread of the disease is controlled. Thorough disinfection of the premises, and proper disposition of the cadavers are very important.

PSEUDO-ACTINOMYCOSIS OF DOGS

Streptotrichosis Canum—Actinomyces Canis

Definition.—A specific disease, caused by the *Actinomyces canis*, characterized by an inflammation of serous membranes, and abscess formation of the subcutaneous tissues.

Occurrence.—This disease is not of frequent occurrence in dogs. A few cases have also been noted in cats.

Etiology.—The specific virus, *Actinomyces canis*, produces long divided filaments, which are easily stained by the Gram-Weigert method. Sometimes they form club-shaped bodies. On artificial media the fungus grows at the body temperature.

Pathogenicity.—When pure cultures are injected intraperitoneally into mice, they produce at the point of inoculation nodules of varying size (pea to bean) containing pus. Subcutaneous injections into rabbits cause at the point of injection nodules which form abscesses. The same condition may be produced in dogs by subcutaneous injections.

Pathology.—The lesions usually found are in the pleura or peritoneum. They consist of an exudate of reddish color collected in the body cavity, containing numerous small, white, pin-point nodes. On the serous membrane will be a number of small nodules, and on the pleura a fibrinous exudate. The lungs often contain a number of pea-sized nodes with caseous centers.

Abscess formation occurs in different parts of the body, particularly in the subparotid region, the vagina, or in the subperitoneal connective tissue of the pelvis. The abscesses contain a grayish turbid mass in which are

many of the characteristic granules. The abscesses usually heal after discharging their contents. The spleen, kidneys and heart muscles often show nodular lesions. Arthritis with pus formation is seen in some cases.

Symptoms.—The disease during the early stages does not present any characteristic symptoms. Later, however, there will be evidence of chronic inflammation of the serous membranes with collections of fluid in the thoracic and abdominal cavities. As the disease progresses, the animal shows general emaciation, weakness, and the presence of abscesses in various parts of the body. The inflammation of the lungs develops gradually and is not attended by any marked change in temperature. Dyspnea is a prominent symptom. The animal gradually grows weaker and dies from exhaustion.

Diagnosis.—The diagnosis is established only after finding the characteristic granules or filaments in the discharge from the abscesses. The symptoms alone would not be sufficient for an accurate diagnosis.

Prognosis.—When the disease shows evidence of general involvement of the body, the prognosis is unfavorable. More favorable are those cases of localized infection.

Treatment.—Abscesses should be opened, drained, and the cavity painted with tincture of iodine. Potassium iodide (dog 0.05 to 0.15; cat 0.005 to 0.05) given once daily is recommended. No further treatment would be of any value.

EQUIVALENTS OF APOTHECARIES IN METRIC MEASURES

<i>Minims</i>	<i>Cubic centimeters</i>	<i>Fluidrams</i>	<i>Cubic centimeters</i>
1	0 061	1	3 7
2	0 123	2	7 39
3	0 185	3	11 09
4	0 246	4	15 00
5	0 308	5	18 50
6	0 370	6	22 50
7	0 431	7	26 00
8	0 493		
9	0 554		
10	0 616	<i>Fluidounces</i>	<i>Cubic centimeters</i>
11	0 678	1	29 57
12	0 739	2	59 14
13	0 801	3	89 00
14	0 863	4	118 29
15	0 924	5	148 00
16	1 00	6	177 42
17	1 06	7	207 00
18	1 12	8	236 59
20	1 23	9	266 16
30	1 84	10	295 73
40	2 46	12	355 00
50	3 08	16	473 17
		20	591 50
		24	710 00
		32	946 35
		128	3785 43

EQUIVALENTS OF APOTHECARIES IN METRIC WEIGHTS

<i>Grain</i>	<i>Gram</i>	<i>Grains</i>	<i>Grams</i>
1-1000 . . . . .	.000065	1-2 . . . . .	.0324
1-500 . . . . .	.000129	1	0648
1-250 . . . . .	.000258	2	1296
1-200 . . . . .	.000324	3	1944
1-150 . . . . .	.00043	4	2592
1-120 . . . . .	.00054	5	3240
1-100 . . . . .	.00064	6	3888
1-75 . . . . .	.00086	7	4536
1-60 . . . . .	.00108	8	5184
1-50 . . . . .	.00129	9	5832
1-40 . . . . .	.00162	10	6480
1-30 . . . . .	.00216	11	7128
1-25 . . . . .	.00259	12	7776
1-20 . . . . .	.00324	13	8424
1-12 . . . . .	.00540	14	9072
1-10 . . . . .	.00649	15	9720
1-8 . . . . .	.0081	20	1 2960
1-6 . . . . .	.0108	25	1 6200
1-5 . . . . .	.0129	30	1 9440
1-4 . . . . .	.0162	35	2 2680
1-3 . . . . .	.0216	40	2 2920
<i>Grains</i>	<i>Grams</i>	<i>Ounces</i>	<i>Grams</i>
45	2 9160	3	93 310
50	3 2400	4	124 414
55	3 5640	5	155 517
59	3 8232	6	186 631
		7	217 724
<i>Drams</i>	<i>Grams</i>	8	248 828
1	3 88	9	279 930
2	7 776	10	311 035
3	11 664	11	342 138
4	15 552	12	373 242
5	19 440	14	435 449
6	23 328	16	497 656
7	27 216	20	622 070
		24	746 484
		32	993 312
<i>Ounces</i>	<i>Grams</i>	48	1422 968
1	31.103	64	1920 624
2	62.2	100	3110 350

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